

**BIOLOGICAL EVALUATION FOR SENSITIVE PLANTS  
SAGEHEN PROJECT  
TRUCKEE RANGER DISTRICT  
TAHOE NATIONAL FOREST**

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## EXECUTIVE SUMMARY

### BIOLOGICAL EVALUATION FOR SAGEHEN PROJECT

**Where:** The Sagehen Basin is an approximate 9,000 acre complex of watersheds at the headwaters of Sagehen Creek, a tributary of Stampede Reservoir, on the east side of the Sierra Nevada Mountain Range. The Basin lies about 10 miles north of Truckee, California, on the west side of Highway 89. In November 2005, almost the entire Basin was designated an Experimental Forest, with the exception of two private timber company holdings in the southwest area of the Basin and a small remainder in National Forest System (NFS) lands of the Truckee Ranger District, TNF.

**NO CONSULTATION WITH USFWS & USFWS NO REQUEST FOR SPECIFIC ACTION NEEDED FOR PLANTS SINCE NO THREATENED, ENDANGERED OR CANDIDATE PLANT SPECIES ARE KNOWN OR SUSPECTED TO OCCUR IN THE SAGEHEN PROJECT ANALYSIS AREA. See Document Number: 1209040928-Species List for Sagehen Project created on September 4, 2012.**

**Biological Evaluation Table 1-Summary of Determinations to sensitive plant species compares the Proposed Action (Alternative 1) and the Fuels Reduction (Alternative 3) to the No Action (Alternative 2).**

SPECIES	HABITAT &/OR DETECTIONS NEAR PROJECT	Alternatives 1 and 3	No Action
<b>Federally Listed</b>			
<i>Calystegia stebbinsii</i>	No habitat is present on the east side of the Tahoe NF.	No Effect.	No Effect.
<i>Packera layneae</i>	No habitat is present on the east side of the Tahoe NF.	No Effect.	No Effect.
<b>Forest Service Sensitive Plants</b>			
<i>Astragalus webberi</i>	No habitat is present in project area.	No Effect.	No Effect.
<i>Boechera rigidissima</i> var. <i>demota</i>	No habitat is present in project area.	No Effect.	No Effect.
<i>Botrychium ascendens</i>	Found within the Sagehen Basin but outside designated units proposed for treatment.	May affect individuals but unlikely to lead toward a trend for listing.	May affect individuals but unlikely to lead toward a trend for listing in the event of catastrophic wildfire.
<i>Botrychium crenulatum</i>	Found within the Sagehen Basin but outside designated units proposed for treatment.	May affect individuals but unlikely to lead toward a trend for listing.	May affect individuals but unlikely to lead toward a trend for listing in the event of catastrophic wildfire.
<i>Botrychium lunaria</i>	Habitat present in perennially wet areas. Assume presence.	May affect individuals but unlikely to lead toward a trend for listing.	May affect individuals but unlikely to lead toward a trend for listing in the event of

SPECIES	HABITAT &/OR DETECTIONS NEAR PROJECT	Alternatives 1 and 3	No Action
			catastrophic wildfire.
<i>Botrychium minganense</i>	Habitat present in perennially wet areas. Assume presence.	May affect individuals but unlikely to lead toward a trend for listing.	May affect individuals but unlikely to lead toward a trend for listing in the event of catastrophic wildfire.
<i>Botrychium montanum</i>	Habitat present in perennially wet areas. Assume presence.	May affect individuals but unlikely to lead toward a trend for listing.	May affect individuals but unlikely to lead toward a trend for listing in the event of catastrophic wildfire.
<i>Bruchia bolanderi</i>	Habitat present in perennially wet areas. Assume presence.	May affect individuals but unlikely to lead toward a trend for listing.	May affect individuals but unlikely to lead toward a trend for listing in the event of catastrophic wildfire.
<i>Calochortus clavatus</i> var. <i>avius</i>	No habitat is present.	No Effect.	No Effect.
<i>Clarkia biloba</i> ssp. <i>Brandegeae</i>	No habitat is present.	No Effect.	No Effect.
<i>Cudonia monticola</i>	Potential habitat is present, assume presence.	May affect supporting mycelium and/or its habitat, but unlikely to lead toward a loss in viability.	May affect individuals but unlikely to lead toward a trend for listing in the event of catastrophic wildfire.
<i>Cypripedium fasciculatum</i>	No habitat is present.	No Effect.	No Effect.
<i>Cypripedium montanum</i>	No habitat is present.	No Effect.	No Effect.
<i>Dendrocollybia racemosa</i>	No habitat is present.	No Effect.	No Effect.
<i>Epilobium howellii</i>	Potential habitat is present, but no detection.	No Effect.	No Effect.
<i>Erigeron miser</i>	No habitat is present.	No Effect.	No Effect.
<i>Eriogonum umbellatum</i> var. <i>torreyanum</i>	Potential habitat is present, but no detection.	No Effect.	No Effect.
<i>Fissidens aphelotaxifolius</i>	No habitat is present.	No Effect.	No Effect.
<i>Fritillaria eastwoodiae</i>	No habitat is present.	No Effect.	No Effect.
<i>Helodium blandowii</i>	Habitat present in perennially wet areas. Assume presence.	May affect individuals but unlikely to lead toward a trend for listing.	May affect individuals but unlikely to lead toward a trend for listing in the event of catastrophic wildfire.

<b>SPECIES</b>	<b>HABITAT &amp;/OR DETECTIONS NEAR PROJECT</b>	<b>Alternatives 1 and 3</b>	<b>No Action</b>
<i>Hydrothyria venosa</i>	Potential habitat is present, but no detection.	No Effect.	No Effect.
<i>Ivesia aperta</i> var. <i>aperta</i>	Potential habitat is present, but no detection.	No Effect.	No Effect.
<i>Ivesia aperta</i> var. <i>canina</i>	Potential habitat is present, but no detection.	No Effect.	No Effect.
<i>Ivesia sericoleuca</i>	Potential habitat is present, one occurrence known away from proposed units.	No Effect.	No Effect.
<i>Ivesia webberi</i>	No habitat is present.	No Effect.	No Effect.
<i>Lewisia cantelovii</i>	No habitat is present.	No Effect.	No Effect.
<i>Lewisia kelloggii</i> spp. <i>hutchisonii</i>	No habitat is present	No Effect.	No Effect.
<i>Lewisia kelloggii</i> spp. <i>kelloggii</i>	No habitat is present.	No Effect.	No Effect.
<i>Lewisia longipetala</i>	No habitat is present.	No Effect.	No Effect.
<i>Lewisia serrata</i>	No habitat is present.	No Effect.	No Effect.
<i>Lupinus dalesiae</i>	No habitat is present.	No Effect.	No Effect.
<i>Mahonia sonnei</i>	Removed from list (USDI 2003)	No Effect.	No Effect.
<i>Meesia triquetra</i>	Habitat present in perennially wet areas and known to occur in fens in Units 46 and 98. Assume presence in all fen areas.	May affect individuals but unlikely to lead toward a trend for listing.	May affect individuals but unlikely to lead toward a trend for listing in the event of catastrophic wildfire.
<i>Meesia uliginosa</i>	Habitat present in perennially wet areas and known to occur in fens in Units 46 and 98. Assume presence in all fen areas.	May affect individuals but unlikely to lead toward a trend for listing.	May affect individuals but unlikely to lead toward a trend for listing in the event of catastrophic wildfire.
<i>Mielichhoferia elongata</i>	No habitat is present.	No Effect.	No Effect.
<i>Monardella follettii</i>	No habitat is present.	No Effect.	No Effect.
<i>Penstemon</i>	No habitat is present.	No Effect.	No Effect.

<b>SPECIES</b>	<b>HABITAT &amp;/OR DETECTIONS NEAR PROJECT</b>	<b>Alternatives 1 and 3</b>	<b>No Action</b>
<i>personatus</i>			
<i>Phacelia stebbinsii</i>	No habitat is present.	No Effect.	No Effect.
<i>Phaeocollybia olivacea</i>	No habitat is present.	No Effect.	No Effect.
<i>Pyrrocoma lucida</i>	No habitat is present.	No Effect.	No Effect.
<i>Tauschia howellii</i>	No habitat is present.	No Effect.	No Effect.

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## INTRODUCTION

The purpose of this Biological Evaluation is to document analysis of the potential effects of the Sagehen Project on sensitive plant species and their habitats. The species includes United States Department of Agriculture (USDA) Forest Service (FS) Region 5 Forester's Sensitive Species (June 8, 1998; updated April 21, 2004 and July, 2006). This biological evaluation was prepared in accordance with Forest Service Manual (FSM) direction 2672.42 and meets legal requirements set forth under Section 7 of the Endangered Species Act of 1973, as amended, and implementing regulations [19 U.S.C. 1536 (c), 50 CFR 402.12 (f) and 402.14 (c)].

Potential habitat for these sensitive species was identified within the project area using aerial photos, vegetation, soil, and elevation maps. Descriptions of the procedure used to conduct the potential habitat search are located at the Supervisors Office in the Tahoe National Forest (TNF) Sensitive Plant Program Standards and Guidelines. Table 1 lists all the Forest Service sensitive species known or suspected to occur on the TNF. The species identified with "Habitat" are those known from and/or with potential habitat in the project area. The other species identified in Table 1 would not be addressed in this evaluation because suitable habitat for those species does not occur within the project area. See Appendix X to the BE for the full description of habitat and distribution for all species on the Tahoe National Forest sensitive plant list.

## CONSULTATION TO DATE

The Fish and Wildlife Service database has been accessed through their website. It will be rechecked every 90 days before the project documentation is due, to obtain the most current list of threatened, endangered, proposed and candidate species that may be present within the project area on the Tahoe National Forest (TNF). The most recent list was dated September 4, 2012 and is available for review at the District Office. The most recent date of inquiry was September 18, 2012. An official species list letter from the Fish and Wildlife Service was created for documentation and has been given the Document Number 120904094328. Currently, there are one endangered, one threatened and one candidate plant species present on or near the Tahoe National Forest. No potential habitat exists within Sagehen Project boundary for *Calystegia stebbinsii* (endangered) and *Packera layneae* (threatened) that have been documented as occurring on the west side of the Tahoe National Forest or *Ivesia webberi* (candidate) species which is known from Sierra Valley. These species have been listed on the TNF plant list.

Forest Land Management Plans for national forests lying within the Sierra Nevada were amended under the Sierra Nevada Forest Plan Amendment (USDA Forest Service 2001, supplemented 2004). The Regional Forester consulted with the California and Nevada Operations Office of Fish and Wildlife Service for that amendment. The Biological Opinion is dated January 11, 2001. The determination in the biological opinion is that the selected action is not likely to jeopardize the continued existence of species listed pursuant to the Act. No terms or conditions were provided.



## **CURRENT MANAGEMENT DIRECTION**

Current management direction on desired future conditions for threatened, endangered and sensitive species on the TNF can be found in the following documents, filed at the District Office:

- Forest Service Manual and Handbooks (FSM/H 2670)
- National Forest Management Act (NFMA)
- Endangered Species Act (ESA)
- National Environmental Policy Act (NEPA)
- Tahoe National Forest Land and Resource Management Plan (LRMP) as and Sierra Nevada Forest Plan Amendment, Final Supplemental Environmental Impact Statement Record of Decision (January 2004)
- Species specific Recovery Plans which establish population goals for recovery of those species
- Species management plans
- Species management guides or Conservation Strategies
- Regional Forester policy and management direction
- Sierra Nevada Forest Plan Amendment, Final Supplemental Environmental Impact Statement, Record of Decision (January 2004)

Apply standards and guidelines from the Tahoe National Forest Land and Resource Management Plan (LMP) (1990), the SNFPA FSEIS ROD (2004). Apply Standard Management Requirements such as contract clauses designed to protect forest resources, Best Management Practices (BMPs) for water quality protection, and other Resource Protection Measures specific to this project (Appendix B). These measures are designed to meet Riparian Management Objectives (RMO) and the Water Quality Objectives of the Lahontan Basin Plan. The Proposed Action would also meet the requirements for obtaining a Timber Harvest Waiver.

### **General Forest Service direction for sensitive species managers are summarized below:**

Assist States in achieving their goals for conservation of endemic species.

As part of the NEPA process, review programs and activities, through a biological evaluation, to determine their potential effect on sensitive species.

Avoid or minimize impacts to species whose viability has been identified as a concern.

If impacts cannot be avoided, analyze the significance of potential adverse effects on the population or its habitat within the area of concern and on the species as a whole.

Establish management objectives in cooperation with the States when a project on National Forest System (NFS) lands may have a significant effect on sensitive species population numbers or distribution. Establish objectives for Federal candidate species, in cooperation with the USFWS and the States.

### **Proposed Action (from main document)**

History of the Project

The Truckee Ranger District staff recognized the risk of another large wildfire and as a result began to actively pursue options to reduce the risk in 2003. The “Sagehen Project” began with the overall goal of reducing the potential of uncharacteristically severe wildfire effects through the implementation of fuels reduction treatments and management direction as laid out in the *Sierra Nevada Forest Plan Amendment Record of Decision* (SNFPA ROD 2004). The initial strategy proposed to reduce the risk of large scale wildfire was to designate SPLATs. SPLATs are intended to slow the spread and reduce the size and severity of a wildfire across a planning landscape as well as to modify fire behavior within the treatment areas. The assumption with SPLATs is that, given an effective treatment area shape and pattern, only a portion of the landscape needs to be treated and maintained to produce desired modifications in wildfire behavior over the entire landscape.

To designate initial SPLATs, the Truckee Ranger District worked closely with the UC Berkeley Sagehen Creek Field Station beginning in 2004. Areas of low fire risk such as high elevation areas and known sensitive areas such as California spotted owl and northern goshawk Protected Activity Centers (PACs), sensitive plant sites, and cultural resource sites were generally avoided when designating SPLATs. In conjunction with this, opportunities to improve forest health and resiliency were also considered, typically tied in with reducing stand densities. Scientists from the University of California (John Battles and Scott Stephens) developed a research approach and collected vegetation and fuels data to examine the effects of SPLATs. From 2004-2008, the focus of the Project planning was to design fuels and forest health treatments within SPLAT treatment units. Upon the designation of the Sagehen Experimental Forest, the Truckee Ranger District also began to work closely with PSW to incorporate experimental forest objectives into project planning.

Early in 2010, the Truckee Ranger District and PSW agreed to take a step back from the internal project planning that had been done to date. An expanded collaborative planning process was begun to engage all interested parties and stakeholders (public, private, and agency) to thoroughly examine the issues that pertain to fuels reduction management in light of new information in GTR 220, as well as information put forth in a master’s thesis titled *American Marten Distributions over a 28 Year Period: Relationships with Landscape Change in Sagehen Creek Experimental Forest, California, USA* (Moriarty, 2009). The thesis documented surveys and inventories to determine American marten distributions within the Sagehen Basin, and how those distributions changed as compared to similar studies in the 1980s. Management implications were put forth to preserve and restore habitat and to increase the likelihood of marten persistence within the Basin. A grant was obtained from the Sierra Nevada Conservancy to support an independent facilitator and the collaborative effort was launched in May of 2010.

#### How the Proposed Action was Developed through Collaboration Collaborative Process

In May 2010, a collaborative planning process was begun to engage all interested parties and stakeholders (public, private, and agency) to examine issues that pertain to fuels reduction

management and to consider new information. Approximately 140 potentially interested and affected parties were initially invited to participate in the process. Since May 2010, approximately 20-60 people (average of 25), representing local city, county, and state agencies, other federal agencies, environmental groups, private companies, universities and research, Forest Service research, and interested citizens have routinely and actively been participants in the collaborative process.

One constraint was placed on the collaborative effort: proposed activities would be limited to the areas covered by the prior (2004-2008) planning effort and data collection areas, where a suite of survey activities had already been completed. The primary reason for this limitation was to avoid the need for and costs of additional surveys and inventories. Opening up the planning process to the entire Sagehen Basin would have added significant costs and time to the process and the Forest Service (PSW and Truckee Ranger District) did not have the funds or timelines that would allow additional surveys at that time. With that one caveat, the Collaborative Planning process began to explore all the issues that the collective body considered meaningful and necessary to address as part of a forest or fuels management project.

The Collaborative Planning process for the Sagehen Project was intended to generate comprehensive stakeholder participation and input. This was used in defining approaches for implementing vegetation and fuels management and ecological restoration activities and methods. In general, the goal of a collaborative process is to reach a decision everyone can accept. In this case, the end goal was to use input, review, and ideas from the collaborative group to generate a Proposed Action and Purpose and Need (PA/PN) document that could be used to begin the National Environmental Policy Act (NEPA) process. Through the collaborative process, PSW and the Truckee Ranger District wanted to provide ample opportunity for satisfying the concerns of involved parties. By discussing and exploring issues in advance of any official NEPA action, the group could collectively reveal and deal with many issues prior to crafting and putting forth a PA/PN.

### **Steps Used to Craft the Proposal**

Collaboration took place primarily through a series of meetings, with an independent facilitator, with information shared through email, web postings, conference calls, and live web meetings. The initial stages were designed to inform stakeholders of the existing conditions and natural resource data that existed regarding the Sagehen Basin and to identify any and all questions, concerns, and issues stakeholders had in relation to a proposed project in the area. Less complex issues and questions were addressed during the meetings and/or through modifications or additions to the proposal. Committees or subgroups of particularly interested stakeholders were formed to address the more complex and specific questions and issues. Four issues drove much of the proposed action development. One general issue was stakeholders were unsure of what a treatment would look like that incorporated concepts from the GTR 220. The other main issues were concepts of ecological restoration and increased forest resiliency to change, habitat

protection and enhancement for the American marten, and how proposed treatments affect fire behavior.

### **GTR 220 Treatment Example – Sagehen Test Plots**

To address the question of what a GTR 220 project looked like, two test plots of approximately three acres each were selected, one in the northeast portion and one in the southwest portion of the Basin. The test plots were designed to be representative of the larger project landscape. Each plot was inventoried, marked (in conjunction with the GTR 220 authors), harvested, and in the case of one plot, underburned during the summer/fall of 2010. Post treatment, the plots were re-inventoried to provide metrics of sizes, species, and numbers of trees removed, basal area removed and retained, and before and after canopy cover. Post treatment photo point monitoring was also conducted. The plots helped to illustrate and test the prescriptions and methods described below under the *Prescriptions and Treatments* section. Specifically the plots demonstrated variable thinning, legacy tree treatment, suppressed cut, dense cover area (DCA), and early seral opening (ESO) prescriptions. See below for more detail.

The test plots proved to be very important to the larger collaborative process. The collaborative group was able to view the resulting stand composition and structure as well as two small adjacent areas that were sample marked to represent a before treatment condition. Data collected proved very effective in communicating the anticipated outcomes of treatments and helped further refine prescriptions for the larger Sagehen Project Area. Lessons learned helped to define operating procedures and to fine tune expectations on the logistics of implementation. The test plots provided a visual confirmation of the concepts expressed in GTR 220. Overall they helped provide common understanding of the concepts, opportunities, and challenges in using GTR 220.

### **Ecological Restoration and Habitat Protection/Enhancement for the Marten**

One particular subgroup was formed to deal specifically with two of the main issues raised. This subgroup dealt with: (1) how concepts of ecological restoration and increased forest resiliency to change from the GTR 220 could be incorporated into project design while (2) also addressing habitat protection and enhancement for the American marten.

A formal definition of ecological restoration is “The process of assisting the recovery of resilience and adaptive capacity of ecosystems that have been degraded, damaged, or destroyed. Restoration focuses on establishing the composition, structure, pattern, and ecological processes necessary to make terrestrial and aquatic ecosystems sustainable, resilient, and healthy under current and future conditions”(USDA Forest Service Manual 2020.5). For the Sagehen Project, the concept of stand level ecological restoration focuses on creating a heterogeneous forest stand that would be representative of a forest stand under a more active fire regime. Therefore, it would be expected that forest stand species mixes, structures, and densities would vary dependent upon topographic variables, such as slope aspect and position.

This subgroup helped to define draft prescriptions and objectives which were brought for review and input to the larger collaborative group at multiple times through the process. In order to do

this, the subgroup reviewed all American marten research conducted in the Sagehen Basin. Recommendations, habitat metrics important to marten (such as snag and down log sizes and densities), and habitat definitions were pulled directly from research studies. In particular, Spencer (1981), Martin (1987), and Moriarty (2009) provided a wealth of information that allowed the subgroup to define high quality marten habitat and designate habitat components and metrics important to marten. Table 1 below describes the habitat definitions (Moriarty, 2009, as slightly modified with input from Katie Moriarty and Bill Zielinski) that the subgroup used to identify high and moderate quality marten habitat within the Basin.

Proposed Action Table 1: Definitions of High and Moderate Quality Marten Habitat within the Sagehen Basin (Moriarty 2009, modified)

Habitat	Forest Type	Size Class*	Canopy Closure**
<b>High Quality</b>			
	Lodgepole Pine (LPN)	4, 5	M, D
	Montane Riparian (MRI)	5, 6	M, D
	Red Fir (RFR)	4, 5	M, D
	Subalpine Conifer (SCN)	4, 5	M, D
	Sierran Mixed Conifer (SMC) – Fir dominated stands only	5, 6	M, D
	White Fir (WFR)	4, 5, 6	M, D
<b>Moderate Quality</b>			
	Eastside Pine (EPN) – Higher lodgepole pine component only	4, 5, 6	P, M, D
	Eastside Pine (EPN)	5, 6	M, D
	Jeffrey Pine (JPN)	5, 6	M, D
	Lodgepole Pine (LPN)	4, 5	P
	Montane Riparian (MRI)	4	M, D
	Red Fir (RFR)	4, 5	P
	Subalpine Conifer (SCN)	4, 5	P

Habitat	Forest Type	Size Class*	Canopy Closure**
	Sierran Mixed Conifer (SMC) – Fir dominated stands only	4	M, D
	Sierran Mixed Conifer (SMC) – Pine dominated stands only	5, 6	M, D

\* Size class in diameter at breast height (dbh) inches: **4** = 11"-24", **5** = >24", **6** = >24" with multi-layered canopy.

\*\* Canopy closure in percent: **P** = 25-39%, **M** = 40-59%, **D** = 60-100%

One of the key principles in GTR 220, the concept of topographic variability as a determining factor in forest composition and structure, was used in combination with other key sources of spatially explicit information (e.g. locations of high quality marten habitat and vegetation types) to partition the landscape into subunits which were termed as emphasis areas. Objectives were then developed for each emphasis area type. Not all the emphasis areas have equal value (as habitat) or have equal ecological potential (for one kind of forest stand or another based on topography or site condition), or generate equal concern (for fire behavior). A benefit of the emphasis area approach was that it provided a way to deal with issues that some in the collaborative group perceived as mutually exclusive. The perceived problem that fuels could not be reduced while still maintaining habitat for late seral species was addressed by explicitly designating where in the potential treatment areas one objective had a greater priority than the other. For example, ridges and drier south facing slopes are areas that typically experience more severe wildfire effects as compared to north facing mid slopes, whereas typically north facing mid slopes tend to have more of the preferred habitats for late seral species. By partitioning the landscape, objectives could be specifically tied to existing and potential conditions that explicitly address landscape heterogeneity and/or habitat quality. Based on these objectives, tailored silvicultural and fuels management strategies were crafted to meet the needs for each of the emphasis areas considering the habitat needs of marten, stand level ecological restoration as described in GTR 220, and fuels reduction to effectively modify fire behavior.

### **How Proposed Treatments Affect Fire Behavior**

To address a third main issue, a Forest Service Enterprise Team was hired to model how proposed treatments might affect post treatment fire behavior. Modified fire behavior combined with increased resiliency would result in less severe wildfire effects. For this treatment strategy to be considered a credible approach, the Forest Service sought evidence that the treatments, addressing multiple objectives, resulted in effective reduction of potential large, uncharacteristically severe wildfire effects. The collaboration group reviewed and provided input to the fire behavior modeling.

### **Areas Identified for Management Emphasis**

## **Overall Goals and Treatment Objectives**

As stated above, one of the main outcomes of the collaborative process was the designation of a number of emphasis areas within the boundaries of the proposed treatment units (original SPLAT boundaries). These emphasis areas became subunits within the treatment units where management would be focused and modified depending on the intent of each emphasis area. Three primary objectives are all reflected emphasis areas 1-7, albeit in different orders of priority. These included: (1) American marten habitat protection and/or enhancement, (2) stand level ecological restoration, and (3) fuels reduction. For emphasis area 8, the objectives were focused on aspen restoration and enhancement.

For emphasis areas 1-7, a common set of metrics were identified to assess different post-treatment stand conditions, which would reflect the primary treatment objectives of that area. The metrics used include: (a) basal area retention, especially in trees greater than 20 inches diameter at breast height (dbh), (b) canopy cover, (c) snag density, (d) large and small down woody material, (e) short snag (or high stump) densities, (f) tree species composition, (g) dense cover areas (DCAs) with multiple tree ages, and early seral openings (ESOs), and (h) fire behavior modeled values under 90<sup>th</sup> percentile weather conditions, including flame lengths and predicted crown fire and associated larger tree mortality.

While it is preferred that prescribed and natural fire become two primary management tools over the long term in all the emphasis areas, interim steps are needed so that fuels may be reduced to a more natural level, allowing fire to occur as it would have if fuels had not built up to unnatural levels. In order to facilitate that, near term management goals include the use of silvicultural and fire/fuels prescriptions and treatment methods that can, to a certain extent, mimic the effects of natural fire. Once these treatments have been applied it is hoped that prescribed or natural fire could occur without heavy mortality and uncharacteristically severe effects. These prescriptions and treatment methods and how they apply to emphasis areas (subunits), are detailed in the sections below beginning with “Prescriptions and Treatments”. Directly below are sections that explain the overall goals and treatment objectives for each emphasis area.

### **Sagehen Project Area Map 1**

Each emphasis area is represented by a different color on the attached Map 1. These colors translate into subunits within the proposed treatment unit boundaries. For example, in treatment unit 38, the two discontinuous green areas are both emphasis area 1 and they are both designated subunit 38-1. In another example, treatment unit 213 is comprised of emphasis areas 1 (green), 2 (blue), 4 (fuchsia), 5 (gray), 6 (orange), and 7 (yellow). It therefore has subunits 213-1, 213-2, 213-4, 213-5, 213-6, and 213-7. Unit 80 is comprised only of emphasis area 8 (purple), and therefore is designated 80-8.

### **Emphasis Areas 1 and 3**

Emphasis areas 1 and 3 represent some of the high quality marten habitat (defined in Table 1) currently existing within the Sagehen Basin. Emphasis area 1 (green areas on Map 1) includes

high value habitats on north facing slopes, on ridges, and on higher elevation south facing slopes (above 6,725 feet). Emphasis area 3 includes high value habitats on lower elevation south facing slopes. High quality habitat for marten also exists outside the treatment unit emphasis areas, primarily along and south of Sagehen Creek and west of unit 46. There are also some scattered pockets of high value habitat north of Sagehen Creek. Because emphasis area 3 is very limited in total area, it was combined with either emphasis area 1 or emphasis area 2 (also high value marten habitat), whichever was closer. Therefore there is no mapped emphasis area 3 and there are no metrics assigned to it. Because numbers were already assigned to emphasis areas when emphasis area 3 was combined with others, re-numbering was not done. This discussion is intended to reduce confusion as to why emphasis area 3 is not shown on the map and why it will not be discussed further in this document. Within the treatment units, approximately 453 acres are identified as emphasis area 1 (see Table 3 below).

Emphasis area 1 values vary above and below 6,725 feet (2,050m), especially on north and east facing slopes in the southwest portion of the Basin (south of Sagehen Creek and west of the Donner Fire area). Areas above 6,725 feet in the southwest portion of the Basin are of relatively higher importance to marten than areas below 6,725 feet and to areas above 6,725 feet in the northeast portion of the Basin. As stated in Spencer (1981), “martens in the upper basin (>2,050m) preferred stands with larger trees than those in the lower basin, reflecting their affinity for old-growth red fir stands.” and that the change from lodgepole/white fir to red fir occurs at 2,050m in elevation on the north and east facing slopes in the southwest portion (south of Sagehen Creek and west of Donner Fire area) of the Basin. This generally occurs in treatment units 156 and 213 and parts of treatment unit 163, see Map 1.

The primary goal is to manage emphasis area 1 for both the conservation and restoration of marten habitat values both in the near term and long term. Secondary and tertiary goals include ecological restoration and fuels reduction, respectively. To manage habitats for marten, this emphasis area would maintain relatively higher basal areas, specifically of larger trees, as compared to all the other emphasis areas. Some trees would likely be removed but basal areas would be lowered only to the extent to facilitate the faster creation of a higher proportion of trees greater than 20 inches dbh while at the same time retaining enough basal area and canopy cover to maintain the emphasis area as current high quality habitat. Of the designated emphasis areas, emphasis area 1 retains/recruits the highest number of snags, short snags/high stumps, and existing DCAs. This would maintain components and areas important for resting/denning martens and would ensure future recruitment of important habitat elements and areas. High amounts of large down wood material and high stumps are also important to provide foraging areas and rest sites. In addition, as compared to the rest of emphasis area 1, relatively higher basal areas, more DCAs, and a higher percentage of red fir and white fir are afforded higher prominence in the portions of the emphasis area above 6,725 feet in the southwest portion of the Basin due to the relatively higher habitat values present in this area. Another goal for emphasis area 1 is to maintain reasonable connectivity (i.e. cover from predators and access to adjoining



areas) across the area. Recent evidence (Moriarty, pers. comm.) suggests that marten are vulnerable to predation if sufficient cover between preferred resting and foraging sites is lacking.

Even though the primary goal for this emphasis area is to manage for marten use, it is also very important to manage for stand level ecological restoration and a heterogeneous forest which will be more resilient to fire and climate-induced stresses. Treatment objective ranges for basal area retention, canopy cover, percentage of the subunit in DCAs and/or ESOs, and tree species compositions help to ensure that a heterogeneous condition would result post treatment. Also, in order to address fuels reduction and the need to reduce the potential of uncharacteristically severe wildfire effects, treatment objectives that address ladder fuel removal, the spatial arrangement of areas where ladder fuels would not be removed, and the horizontal arrangement of fuels to break up continuous fuel beds help to address these concerns.

#### **Emphasis Areas 2 and 4**

Emphasis areas 2 and 4 include the drainage bottoms that currently support high quality marten habitat (emphasis area 2, blue areas on Map 1) and the drainage bottoms that do not currently support high quality marten habitat, i.e. the habitat does not currently meet the criteria described in Table 1 (emphasis area 4, fuchsia areas on Map 1). As stated above, high quality habitat for marten also exists outside the treatment unit emphasis areas. Emphasis areas 2 and 4 include perennial stream courses and other intermittent and ephemeral drainages throughout the Basin. These locations tend to be relatively more mesic, retain moisture longer through the season and generally support more dense and diverse vegetation conditions than the surrounding stands. Stream courses and other mesic drainage bottom areas are known to be preferable habitat for many wildlife species. They tend to have more herbaceous vegetation cover and microhabitats, provide more escape cover, are accessible to permanent water sources, and support a larger volume and diversity of vertebrates and invertebrates. Thus emphasis areas 2 and 4 intend to maintain and enhance these conditions. In cases where trees are encroaching on meadows or open herbaceous areas, the basal area/crown cover of trees would be reduced to maintain and/or restore meadow habitat as well as encourage herbaceous cover. By contrast, some drainages tend to be relatively more xeric and have fewer to no adjoining wet meadows or similar features. Under these conditions these areas still retain moisture for a longer period of the year than surrounding stands and tend to support denser vegetation and often larger trees. Under these circumstances the objective is to maintain higher basal areas and crown cover and a higher proportion of dense vegetation and structural diversity that these areas tend to provide. Within the treatment units, approximately 103 acres are identified as emphasis area 2 and 173 acres are identified as emphasis area 4 (see Table 3 below).

The primary distinction between emphasis area 2 and emphasis area 4 is the consistent presence of greater than 11 inches dbh lodgepole pine as the dominant tree species in most of emphasis area 2 with an average canopy cover of 40% or more. Emphasis area 4 can include perennial and intermittent streams, as well as mesic and relatively xeric ephemeral drainages with a variety of tree cover types. Overall, emphasis areas 2 and 4 are intended to provide higher basal areas of

larger trees than the areas surrounding them except for emphasis area 1. They would provide relatively high canopy closures within the treed areas but would also allow enough light for well-developed herbaceous ground cover where sufficient water exists. In addition they would also have higher proportions of snags and short snags/high stumps which would provide resting sites, foraging features, and prey cover for martens. Because of their preferential use for foraging habitat, treatment objectives include the highest retention of large/small down wood components. The differences arise in emphasis area 4 because it includes not only perennial stream courses, but also many intermittent and ephemeral drainages which are highly variable in moisture conditions, vegetation types, position on slope, and aspect. More variation occurs in this emphasis area, thus treatment objectives are also more variable. Relatively more mesic conditions would have more downed logs and high stumps and would be composed of more lodgepole pine; while more xeric conditions would have less dead wood components and would trend on a scale more towards white and red fir and/or ponderosa or Jeffrey pine (depending on slope/aspect).

Even though the primary goal for these emphasis areas is to manage for marten use, especially foraging habitat, it is also very important to manage for stand level ecological restoration and a heterogeneous forest which will be more resilient to fire and climate-induced stresses. Treatment objective ranges for basal area retention, canopy cover, snag, down wood, and short snag densities, percentage of the subunit in DCAs and/or ESOs, and tree species compositions help to ensure that a heterogeneous condition would result post treatment. Also, in order to address fuels reduction and the need to reduce the potential of uncharacteristically severe wildfire effects, treatment objectives that address ladder fuel removal, the spatial arrangement of areas where ladder fuels would not be removed, and the horizontal arrangement of fuels to break up continuous fuel beds help to address these concerns.

### **Emphasis Area 5**

Emphasis area 5 (gray areas on Map 1) represents north facing slopes that are not currently high quality marten habitat. The primary goal in emphasis area 5 is to work towards stand level ecological restoration, followed by marten habitat enhancement and fuels reduction. In general the treatment objectives would move the area towards a more heterogeneous forest that would improve resilience to fire and climate induced stresses, while at the same time still providing habitat elements for old forest associated sensitive wildlife species, such as the marten, northern goshawk, and California spotted owl. This emphasis area is also present in some plantations (units 46, 76, 87, and 99). For the Sagehen Project, the objectives in these plantations would be focused on the first steps of achieving a resilient heterogeneous forest. Some examples of this are retaining some young porcupine damaged trees that could grow into trees with split tops and other defects suitable for nesting/resting structures, and retaining residual or legacy trees and areas that are sparsely treed – for plantations, these areas would become similar features to DCAs and ESOs. See the “Prescriptions and Treatments” section below for more detail.

For the remainder of emphasis area 5, outside of plantations, objectives include retaining individual trees, small groups of trees, retaining existing DCAs, and creating ESOs that can support younger cohorts of a variety of species. Due to the more northerly exposure, emphasis area 5 would support more basal area and canopy cover as compared to ridges and south facing slopes. However it would support less basal area and canopy cover than drainages, because of the more xeric conditions, and less than emphasis area 1 because of the objectives to maintain higher basal areas and canopy cover for high quality marten habitat. Overall however, treatment objectives specify that enough basal area, canopy cover, and habitat components such as snags, down wood, short snags, and DCAs would be retained to ensure that the emphasis area retains, or in plantations, facilitates the creation of, important habitat structures for wildlife and provides suitable habitat or moves the habitat towards suitability for old forest species. Also, as in emphasis areas 1, 2, and 4, to address fuels reduction and the need to reduce the potential of uncharacteristically severe wildfire effects, treatment objectives are designed that address ladder fuel removal, the spatial arrangement of areas where ladder fuels would not be removed, and the horizontal arrangement of fuels to break up continuous fuel beds. Within the treatment units, approximately 1,028 acres are identified as emphasis area 5 (see Table 3 below).

### **Emphasis Areas 6 and 7**

Emphasis area 6 (orange areas on Map 1) represents vegetation types not identified as high value marten habitat on south facing slopes and emphasis area 7 (yellow areas on Map 1) represents vegetation types not identified as high value marten habitat on ridges. In emphasis areas 6 and 7 where fuels reduction is the highest priority, treatments are designed to substantially modify wildfire behavior and reduce the potential of uncharacteristically severe wildfire effects. Although important in all the other emphasis areas, in emphasis areas 6 and 7 especially, the post treatment fire behavior is targeted to meet conditions for SPLATs. SPLATs are designed to achieve, under 90<sup>th</sup> percentile fire weather conditions, an average of a four foot flame length, that surface and ladder fuels would be removed as needed to meet less than 20 percent fire mortality in dominant and co-dominant trees, and that tree crowns would be thinned to meet less than 20 percent probability of initiation of crown fire (SNFPA ROD 2004, Standard and Guideline #5, pg. 50). The secondary priority of stand level ecological restoration in these areas is focused on facilitating conditions that would result under an active fire regime, which includes a more heterogeneous forest that is resilient to fire and climate induced stresses. Within the treatment units, approximately 740 acres are identified as emphasis area 6 and 150 acres are identified as emphasis area 7 (see Table 3 below).

Overall, in emphasis areas 6 and 7, basal area and canopy cover would be lower than in emphasis areas 1-5. In emphasis area 6, basal area would be reduced to a level that would help increase the pace of tree growth so that a higher percentage of the basal area is in larger (greater than or equal to 20 inches dbh) trees in a shorter amount of time. In emphasis areas 6 and 7, the intent is produce stand conditions that are more similar to those that would have been produced under an active fire regime. A more heterogeneous forest would be created by retaining individual trees,

with particular emphasis on tree species more suited to xeric environments, retaining small groups of trees, retaining DCAs, and creating ESOs that can support younger cohorts of a variety of species.

Emphasis areas 6 and 7 are also present in some plantations (units 46, 76, and 87, and emphasis area 6 in unit 99). In plantations, fuels reduction objectives to modify wildfire behavior and reduce severe wildfire effects can usually be achieved in a relatively short timeframe. For the Sagehen Project, the secondary objectives in these plantations would be focused on the first steps of achieving heterogeneous forest. Some examples of this are retaining some young porcupine damaged trees that could grow into trees with split tops and other defects suitable for nesting/resting structures, and retaining residual or legacy trees and areas that are sparsely treed – for plantations, these areas would become similar features to DCAs and ESOs. See the “Prescriptions and Treatments” section below for more detail.

In addition, the third priority of these areas is marten habitat. Because of their topographic position on drier south facing slopes and ridges, usually with shallower soils, it is unlikely these emphasis areas would develop high quality marten denning/resting habitat over the long term. The exposures and soils would likely preclude the development of dense, large treed fir stands. However these areas could provide for marten movement. Therefore the objectives include: to avoid the creation of barriers to marten movement (i.e. large openings). Therefore enough basal area, canopy cover, and habitat components such as snags, down wood, and existing DCAs would be retained to allow marten movement in/through these emphasis areas.

### **Emphasis Area 8**

Emphasis area 8 (purple areas on Map 1) is unique in that its only goal is stand level ecological restoration of aspen stands. However this goal is solely focused on a small forest stand scale. This does not represent all aspen stands within the Basin. Where small aspen stands exist within the potential treatment units, the goal is to improve/restore the aspen stands. Under a more active fire regime, conifer encroachment into aspen stands would be minimized and the aspens would be able to reproduce through suckering. However, with a lack of fire disturbances, conifers are able to shade out aspens and impede successful reproduction. The only objectives considered in this emphasis area are minimizing direct conifer competition to existing aspens and to remove conifers to the extent that the aspen stand could expand appropriately to the extent site conditions would allow. Within the treatment units, approximately 6 acres are identified as emphasis area 8 (see Table 3 below).

### **Forest Plan Direction**

Most of the Sagehen Project Area is encompassed within the Sagehen Experimental Forest. A small portion of the area along the northeastern portion of the Project Area lies on the Truckee Ranger District of the Tahoe National Forest. The *Establishment Record for Sagehen Experimental Forest* (November 28, 2005) specifies that management direction for the Sagehen Experimental Forest will follow the *Tahoe National Forest Land and Resource Management*

*Plan* (USDA 1990) as amended by the Sierra Nevada Forest Plan Amendment (USDA 2004) (referred to as the Forest Plan) for Management Areas 036 (Sagehen Basin) and 043 (Sagehen Station). Management direction for the portion of the Project Area on the Truckee Ranger District is provided by the Forest Plan.

A wildland urban interface (WUI) defense zone surrounds the immediate vicinity of the Sagehen Creek Field Station, and the defense zone is buffered by a WUI threat zone. Most of the Project Area lies within the old forest emphasis area land allocation, although the eastern portions of treatment units 46, 76, 98, and 100 and all of unit 99 lie within the general forest land allocation. Overlapping these land allocations are five northern goshawk and one California spotted owl protected activity centers (PACs) as well as one spotted owl home range core area (HRCA). Finally, Sagehen Creek has been recommended for Wild and Scenic River designation (*Record of Decision for Eight Eastside Rivers Wild and Scenic River Study Report and FEIS*, 1999), and is currently managed under interim management standards as a Scenic river. The emphasis area objectives for the Sagehen Project are consistent with Forest Plan desired conditions, management intents, and management objectives for these land allocations. Proposed activities would adhere to Forest Plan standards and guidelines.

### **Prescriptions and Treatments**

The proposed action would apply a suite of integrated silvicultural and fire/fuels prescriptions within each treatment unit. Application of the prescriptions (via various treatment methods) would set the stage for achieving emphasis area treatment objectives, described in the preceding section. The sections below describe the prescriptions and treatment methods proposed for the Sagehen Project. See Table 2 *Prescription and Method Summary* below for the units to which each of the following prescriptions apply.

### **Order of Prescription Application**

Implementing the following silvicultural prescriptions involves careful consideration of fire: both the follow-up application of fire/fuels prescriptions as well as the stand structure conditions that would likely develop under an active fire regime. On-the-ground decisions about which individual trees and groups of trees to retain are made in light of (1) ensuring overall stand structure will remain intact following application of prescribed fire and (2) mimicking stand structures that would develop under an active fire regime.

The prescriptions can be highly variable and site-specific, and are set within the context of the existing stand's structure, tree species composition, and as compared to the emphasis area objectives for each subunit. For most units within the Sagehen Project, implementing the following silvicultural prescriptions involves applying each of the first five prescriptions in a step-wise fashion:

- The first step involves identifying both the dense cover areas (DCAs) and early seral openings (ESOs), and laying out their boundaries out on the ground.

- Next, the trees suitable for legacy tree treatments are identified and the surrounding trees proposed for removal are marked.
- After this is done, the variable thinning mark is anchored to DCAs, ESOs, and legacy tree treatments.
- In addition, the suppressed cut prescription is applied to remove suppressed trees contributing to ladder fuels outside of DCAs.
- Finally in subunits where the current snag/short snag densities are substantially below desired densities, decadent feature enhancements (partial tree girdling and/or short snag creation) would be identified for implementation either by machinery or hand.

All five of these prescriptions would be applied, in a step-wise fashion, for each identified unit (see Table 2). If there are no trees suitable for legacy tree treatment in a given unit, that prescription would be dropped during marking. The remaining two prescriptions, plantation thinning and aspen restoration are applied specifically to plantations and aspen stands, respectively.

### **Silvicultural Prescriptions**

#### **Dense Cover Areas (DCAs) and Early Seral Openings (ESOs)**

Dense cover areas (DCAs) are small areas distributed within treatment units that provide continuous vertical and horizontal cover with a mixture of shrubs and trees along with large and small down wood, snags, and high stumps. DCAs would typically contain clumps of trees of various size classes as well as a variety of snag and down wood sizes. These existing DCAs, ranging in size from 0.25-1 acre, would contribute to/enhance within-stand horizontal and vertical structural diversity and provide important old forest and/or mid seral habitat elements. For example existing DCAs can be representative of multiple layered late seral conditions with high levels of decadence and dead wood. They can also represent a more mid seral condition with brush and a medium sized tree overstory that provide important hiding and resting cover for wildlife and provide foraging and/or movement cover for martens and other late seral species. ESOs would be comprised of dense young regenerating trees and/or shrubs to provide early successional habitat within larger stands managed for late successional or old forest habitat. ESOs, from 0.25-0.50 acre, would enhance within-stand age and species diversity as well as provide prey and foraging habitat for old forest associated wildlife species.

Two primary methods would be used to retain and create DCAs or ESOs: For DCAs, an area would be designated that has multiple wildlife habitat elements, such as large down woody material, a mixture of tree age classes (including solitary and groups of large trees), large snags, multiple tree canopy layers; and/or trees with features associated with wildlife use (for example, platforms, mistletoe brooms, forked tops, and cavities). No mechanical tree removal would be conducted in these “existing DCAs”. For ESOs, by taking advantage of existing conditions, such as areas of sparse tree cover, thinner soils, or pockets of extensive tree mortality, openings would be created by removing most or all of the existing trees and either planting or allowing natural

shrub and/or tree regeneration to create an ESO of early successional habitat. No planting of trees or shrubs would occur in fens.

Prescribed fire would be an important management tool within DCAs and ESOs. For DCAs comprised of multiple sizes of trees, snags, and down wood, prescribed fire would be carefully applied to maintain key habitat elements, particularly snags and down wood. While underburning in DCAs would likely result in some mortality of suppressed and subdominant trees, burning prescriptions would be designed to ensure the overall structure of the DCA would remain intact. For ESOs (regeneration areas), prescribed fire would be applied to regenerate shrubs and create suitable areas for shade-intolerant tree species to regenerate.

**When:** A decision on this project would be made by the summer or early fall of 2012. Implementation could begin as early as the spring of 2013. Most proposed treatments would be implemented within the next 5 years.

### **2.1.2. Alternative 2 (No Action Alternative)**

Under this alternative, the proposed action would not be implemented in this area at this time.

### **3.2. Alternative 3 (Non-Commercial Funding Alternative)**

Alternative 3 was developed in accordance with Eastern District Court Judge England's November 4, 2009 order for Case 2:05-cv-00205-MCE-GGH. The order requires the Forest Service to analyze a non-commercial funding alternative in detail for all new fuel reduction projects not already evaluated and approved as of November 4, 2009. To develop this alternative, the proposed treatment areas were revisited to determine (a) if a beneficial fuel treatment was possible and (b) what those treatments would be.

A total of 1,132 acres were considered for non-commercial treatments. All units were not considered to be treated under this alternative because the cost would have been too great. Therefore, in order to reduce implementation costs to around one million dollars, the most critical units were chosen for treatment (including fuels only prescriptions on all units would have cost close to twice that amount). The treatments identified only partially meet the purpose and need by addressing hazardous surface and ladder fuels. The following actions are proposed under Alternative 3 (see table below) and are displayed on the above map. Note that while emphasis areas are displayed here, there are no project goals specifically tied to each emphasis area in Alternative 3 like there are in Alternative 1. The emphasis areas are displayed solely to provide a consistent way to compare the alternatives.

### **Proposed Action Table 2- Summary of Alternative 3 by Treatment Area.**

<b>Unit</b>	<b>Total Acres</b>	<b>Emphasis Area</b>	<b>Unit Emphasis Area Acres</b>	<b>Silvicultural Rx – see Order of Prescription Application section above</b>	<b>Silvicultural Treatment Method</b>	<b>Fire/Fuels Rx</b>	<b>Fire/Fuels Treatment Method</b>
<b>33</b>	118	1	4	No Treatment	N/A	No Treatment	N/A
		4	30				
		5	28				
		6	56				
<b>34</b>	68	5	16	No Treatment	N/A	No Treatment	N/A
		6	47				
		7	5				
<b>35</b>	64	1	8	No Treatment	N/A	No Treatment	N/A
		4	6				
		5	7				
		6	37				
		7	6				
<b>36</b>	101	4	18	No Treatment	N/A	No Treatment	N/A
		5	13				
		6	56				
		7	14				
<b>38</b>	210	1	67	No Treatment	N/A	No Treatment	N/A
		4	7				
		5	86				
		7	50				
<b>39</b>	32	5	32	No Treatment	N/A	No Treatment	N/A
<b>46</b>	621	4	47	No Treatment	N/A	Surface Fire Rx	Underburn
		5	431	Plantation Thin	Mechanical Mastication	Lop & Scatter Surface Fire Rx	Mastication Underburn
		6	105				
		7	38				
<b>47</b>	33	5	33	No Treatment	N/A	Surface Fire Rx	Underburn
<b>61</b>	20	1	15	Suppressed Cut	Hand Thinning	Pile Burn Rx Surface Fire Rx	Hand Pile Burn Underburn
		2	5				
<b>73</b>	144	4	6	No Treatment	N/A	No Treatment	N/A
		5	107				
		6	27				



Unit	Total Acres	Emphasis Area	Unit Emphasis Area Acres	Silvicultural Rx – see Order of Prescription Application section above	Silvicultural Treatment Method	Fire/Fuels Rx	Fire/Fuels Treatment Method
		7	4				
76	91	4	4	No Treatment	N/A	Surface Fire Rx	Underburn
		5	37	Plantation Thin	Mechanical Mastication	Lop & Scatter Surface Fire Rx	Mastication Underburn
		6	42				
		7	8				
80	5	8	5	No Treatment	N/A	No Treatment	N/A
85	64	5	10	No Treatment	N/A	No Treatment	N/A
		6	53				
		8	1	No Treatment	N/A	No Treatment	N/A
87	207	5	67	No Treatment	N/A	No Treatment	N/A
		6	130				
		7	10				
89	34	4	6	No Treatment	N/A	No Treatment	N/A
		6	28				
90	40	6	40	No Treatment	N/A	No Treatment	N/A
91	9	2	9	Suppressed Cut	Hand Thinning	Pile Burn Rx	Hand Pile Pile Burn
98	63	1	43	Suppressed Cut	Hand Thinning	Pile Burn Rx	Hand Pile Pile Burn
		2	9				
		5	11				
99	67	1	7	Suppressed Cut	Hand Thinning	Pile Burn Rx	Hand Pile Pile Burn
		2	4				
		4	11				
		5	37	Plantation Thin	Mechanical Mastication	Lop & Scatter	Mastication
		6	8				
100	120	1	14	Suppressed Cut	Hand Thinning	Pile Burn Rx Surface Fire Rx	Hand Pile Pile Burn Underburn
		2	19				
		4	17				
		5	46				
		6	24				
156	84	1	84	No Treatment	N/A	No	N/A

Unit	Total Acres	Emphasis Area	Unit Emphasis Area Acres	Silvicultural Rx – see Order of Prescription Application section above	Silvicultural Treatment Method	Fire/Fuels Rx	Fire/Fuels Treatment Method
						Treatment	
163	82	1	29	No Treatment	N/A	No Treatment	N/A
		5	49				
		7	4				
213	268	1	182	No Treatment	N/A	No Treatment	N/A
		2	11				
		4	21				
		5	18				
		6	25				
		7	11				
282	108	2	46	Suppressed Cut	Hand Thinning	Pile Burn Rx Surface Fire Rx	Hand Pile Burn Underburn
		6	62				

#### **I. Plant BE EXISTING ENVIRONMENT in the Sagehen Basin (plant communities)**

The plant communities present within the Sagehen Project area are primarily forested by eastside pine, and white fir mixed conifer forests, lodgepole pine, red fir and white fir stands. These forested plant communities include Jeffrey pine, white fir, red fir, western white pine and lodgepole pine. Aspen has been found to occur in a few stands in the northwestern portion of the project area. Common shrubs include greenleaf manzanita, snowberry, snowbrush, whitethorn, and gooseberry. Sagehen Creek runs through the Sagehen Project area as do many perennial and intermittent streams that support riparian vegetation including willows, mountain alder and numerous herbaceous species of grasses and grass-like plants. The majority of the riparian vegetation occurs within fens which typically occur along many of the north-facing tributaries to Sagehen Creek. These fens harbor a high diversity of plant species including several listed as Forest Service sensitive.

#### **Sensitive plants and habitats considered:**

The sensitive plant potential habitat that exists within the Sagehen Project area occurs within fens and riparian vegetation along perennial streams banks mostly along Sagehen Creek and its tributaries. The units including the fens and riparian vegetation were surveyed by qualified botanists within the Sagehen Project area. The stream banks are vegetated by mountain alder and willows, moist forests and other riparian vegetation. The riparian areas are habitat for many of the sensitive plants such as mosses (*Meesia triquetra*, *M. uliginosa*, *Helodium blandowii* and *Bruchia bolanderi*), moonworts (*Botrychium ascendens*, *B. crenulatum*, *B. lunaria*, *B. minganense*, and *B. montanum*) and Howell's Epilobium (*Epilobium howellii*).

Plumas ivesia (*Ivesia sericoleuca*) is known to occur around the margins of a small meadow near the Sagehen Creek Field Station. Units were surveyed for all Ivesia species, but no new

occurrences were found. Very little potential habitat for Sierra Valley ivesia (*Ivesia aperta* var. *aperta*) and Dog Valley ivesia (*Ivesia aperta* var. *canina*) exists in low sagebrush communities on the outer edges of some of the eastside pine forests in adjacent ephemeral wet meadows. No habitat for Webber's ivesia (*I. webberi*) which is a "candidate species" is expected based on the current known distribution and elevational constraints for this species. Donner Pass buckwheat (*Eriogonum umbellatum* var. *torreyanum*) has been reported as occurring as close as Webber Peak on the Sierraville Ranger District but not at the same elevations where the project area exists. Since there are several occurrences of various varieties of *Eriogonum umbellatum*, individual plants were checked for the possibility that they may be the sensitive variety whenever *Eriogonum umbellatum* was present.

Three fungi species have recently been added to the Tahoe National Forest sensitive plant list. Of those, only *Cudonia monticola* would be likely to occur within some of the more moist red fir and white fir forests. Habitat within the Sagehen Basin would most likely occur on the north-facing slopes and drainage bottoms, where these forests would have higher moisture levels, at this elevation of the eastside of the Sierra Nevada Crest. See table 2 below that lists the Forest Service Sensitive plant species along with the current Federal status, California Native Plant Society (CNPS) status and their respective habitat ranges. Surveys for fungi are usually not performed; since fungi don't always put up fruiting bodies surveys are not a reliable way to detect fungi presence or absence. Some rare fungi species have been placed on TNF sensitive plant lists because they have been documented as being present within the boundaries or in close proximity to the Tahoe NF in the recent past. *Cudonia monticola* is the fungi species that has been considered to have potential habitat within the Sagehen Project Area.

One lichen species has been added to the Tahoe National Forest sensitive plant list because it has been found on National Forests to the north and south of the Tahoe NF. It is a lichen species that is known to be found in fast running cold streambeds. Although we have looked for it, no water lichen (*Hydrothyria venosa*, now known as *Peltigera hydrothyria*) has been found to occur within the Sagehen Project area or on the Tahoe NF.

Surveys for all sensitive plants with potential habitat in the Sagehen Project Area have been conducted over several years beginning in July, 2004 by Forest Service botanists and qualified biological technicians. Several species listed on the Tahoe NF sensitive plant species were found to occur. Twenty-six occurrences have been found on the Tahoe National Forest, 13 of those have been documented within the Sagehen Basin and two were documented to be present within proposed treatment units. Thirty-one occurrences of *M. uliginosa* have been found on the Tahoe National Forest, 14 of those have been documented within the Sagehen Basin and three were documented to be present within fens that were within proposed treatment units.

Several occurrences of moonwort species were also found to be present within fens. These occurrences include two *Botrychium ascendens* and three *B. crenulatum* and a few *Botrychium* species that were hard to identify to the species level but would be treated as a sensitive *Botrychium* species.

There are a few sensitive plant species on the Tahoe National Forest (TNF) Sensitive Plant List that do not produce above ground parts every summer season or are exceptionally small, so even thoroughly performed surveys may not show that they are present. These species include very small species such as the mosses *Bruchia bolanderi*, *Helodium blandowii*, *Meesia triquetra*, *M. uliginosa*, and the moonworts that can stay dormant underground such as *Botrychium ascendens*,

*B. crenulatum*, *B. lunaria*, *B. minganense* and *B. montanum*. Therefore, these species will be assumed to be present and Best Management Practices would be implemented to maintain the most sensitive habitat within the Riparian Conservation Areas (RCAs). These sensitive habitat types within the RCAs include special aquatic features such as fens, stream banks, stream courses, springs and seeps. For example, flag and avoid mitigations and the installation of Dense Cover Areas would be used to keep tractors out of the 25 foot buffer around such features. (See Appendix B)

### **Sensitive Plant Species Ruled out:**

Several sensitive plant species are known or have potential to occur on the eastside of the Tahoe, but do not have any potential habitat within the Sagehen Project Area. These species include Galena rockcress (*Boechnera rigidissima* var. *demota*), starved daisy (*Erigeron miser*), Kellogg's lewisia (*Lewisia kelloggii* ssp. *hutchisonii* and *Lewisia kelloggii* ssp. *kelloggii*), long-petaled lewisia (*Lewisia longipetala*), sticky pyrocoma (*Pyrocoma lucida*) and Howell's Tauschia (*Tauschia howellii*). See Appendix X for back-round information about these species. No further analysis for these species is necessary.

There are other Tahoe National Forest threatened, endangered and sensitive plant species which have potential to occur on the westside of the Tahoe but not on the eastside or within the Sagehen Project Area. See the Plant BE Appendix X for habitat descriptions. The threatened plant species is Layne's ragwort (*Packera layneae*) which was recently found to occur on a serpentine site at a low elevation on the west side of the Tahoe along with the endangered Stebbins's morning-glory (*Calystegia stebbinsii*). These two species have a very restricted habitat range and are only known from low elevation serpentine sites on the west side of the Sierra Nevada Mountains. Other sensitive plant species that only have potential to occur on the west side of the Tahoe National Forest are Webber's milk-vetch (*Astragalus webberi*), Pleasant Valley tulip (*Calochortus clavatus* var. *avius*), Brandegee's fairyfan (*Clarkia biloba* spp. *brandegeae*), clustered lady's slipper orchid (*Cypripedium fasciculatum*), mountain lady's slipper orchid (*Cypripedium montanum*), butte fritillaria (*Fritillaria eastwoodiae*), wet-cliff Lewisia (*Lewisia cantelovii*), sawtoothed Lewisia (*Lewisia serrata*), Follett's Monardella (*Monardella follettii*), closed-throated beardtongue (*Penstemon personatus*), and Stebbins Phacelia (*Phacelia stebbinsii*).

*Mielichhoferia elongata* is one species of moss that has been found to occur on wet metamorphic rocks with a high concentration of heavy metals such as copper on the west side of the Tahoe National Forest and other mountainous areas within California (Norris and Shevock 2004). *Fissidens aphelotaxifolius* is a moss species that is known to occur on rock cliffs around fast moving water.

There are two species of fungi on the Tahoe National Forest Sensitive Plant List that have been found to occur within the lower to mid mixed conifer types of the west side of the Tahoe NF. The sensitive fungi that will not be considered as having potential habitat on the eastside of the Tahoe NF are *Dendrocollybia racemosa* and *Phaeocollybia olivacea*.

The Truckee barberry was considered since it was listed on the endangered species list and in the Tahoe Land Management Plan (LRMP) as being an endangered species. Since then, the U.S. Fish and Wildlife Service found *Mahonia sonnei* to be synonymous with a common species from Oregon *Berberis sonnei* (USDI 2003) and so it has been omitted for that reason.

## II. DESCRIPTION OF AFFECTED SENSITIVE SPECIES HABITATS AND KNOWN PRESENCE

The following summarizes what is known about each of the TNF sensitive plants with potential habitat in the project area. The TNF works cooperatively with the California Department of Fish and Game in development of the Natural Diversity Database, and with the California Native Plant Society to gather information about rare plants. The TNF rare plant program document provides a more detailed summary of what is known about each of the sensitive plants. This document is titled Tahoe National Forest Sensitive Plant Standards and Guidelines and is updated periodically. Copies are on file at all TNF District Offices and at the Forest Supervisor's Office. The existing environment for those species that are on the Tahoe National Forest sensitive plant list which are known to only occur on the westside of the Sierra Crest and listed in the Summary Table 1 as having no potential habitat in the Sagehen Project Area will not be discussed below, but placed in the Plant BE Appendix X. Assume that there would not be any direct, indirect or cumulative effects to these species or habitat since they occur on the westside of the Tahoe National Forest, at lower elevations or on serpentine outcrops without potential habitat in the Sagehen Project Area.

**Biological Evaluation Table 2 – Tahoe National Forest Threatened, Endangered, Sensitive Plants and Fungi – Their status according to the U.S. Fish and Wildlife Service and the California Native Plant Society and their habitat range.**

SPECIES	USFWS Status	Global Ranking	State Ranking	CNPS Status	HABITAT
<b>Federally Listed</b>					
<i>Calystegia stebbinsii</i>	Endangered	G1	S1.1	1B.1	Openings in chaparral, cismontane woodland/serpentinite or gabbroic, elevation 600-3,600 feet
<i>Packera layneae</i>	Threatened	G2	S2	1B.2	Openings in chaparral, cismontane woodland/serpentinite or gabbroic, elevation 600-3,600 feet
<b>Forest Service Sensitive</b>					
<i>Astragalus webberi</i>	None	G1	S1.2	1B.2	2,700-4,000 feet, westside forested
<i>Boechera rigidissima</i> var. <i>demota</i>	None	G3T2Q	S1.2	1B.2	7,500-8,500 feet, openings
<i>Botrychium ascendens</i>	None	G2G3	S1.3	2.3	4,000 ft. +, moist and riparian areas.
<i>Botrychium crenulatum</i>	None	G3	S2.2	2.2	4,000 feet +, moist and riparian areas
<i>Botrychium lunaria</i>	None	G5	S2.3	2.3	4,000 feet+, moist and riparian areas
<i>Botrychium</i>	None	G4	S1.2	2.2	4,000 feet+, moist and

SPECIES	USFWS Status	Global Ranking	State Ranking	CNPS Status	HABITAT
<i>minganense</i>					riparian areas
<i>Botrychium montanum</i>	None	G3	S1.1	2.1	4,000 feet+, moist and riparian areas
<i>Bruchia bolanderi</i>	None	G2	S2.2	2.2	4,000-9,500 feet, moist and riparian areas.
<i>Calochortus clavatus</i> var. <i>avius</i>	None	G4T3	S3.2	1B.2	3,000-5,800 feet, rocky places (FHRD)
<i>Clarkia biloba</i> ssp. <i>Brandegeae</i>	SC	G4T3	S3	1B.2	2,500 feet and below, woodlands
<i>Cudonia monticola</i>	None	G3	S1	None	Litter and decaying wood
<i>Cypripedium fasciculatum</i>	None	G4	S4.2	4.2	500-6,000 feet, moist mixed conifer
<i>Cypripedium montanum</i>	None	G4	S3.2	4.2	<7,000 ft., openings in forested areas
<i>Dendrocollybia racemosa</i>	None	G2G3	S1S12	None	Host – another fungus
<i>Epilobium howellii</i>	None	G4	S4	4.3	6,000-9,000 feet, wet areas
<i>Erigeron miser</i>	None	G2	S2.3	1B.3	About 6,000 feet and above, (granite)
<i>Eriogonum umbellatum</i> var. <i>torreyanum</i>	SC	G5T2	S2.2	1B.2	6,000-8,000 feet, unstable soils
<i>Fissidens aphelotaxifolius</i>	None	GU	S1.2	2.2	Sea level to 6,000 feet, wet soil, humus and rocks along narrow streams
<i>Fritillaria eastwoodiae</i>	SC	G3Q	S3.2	3	100-5,000 ft., westside forested areas
<i>Helodium blandowii</i>	None	G5	S1.3	2.3	Fens and wet habitat in meadows
<i>Hydrothyria venosa</i>	None	G3	None	None	1,150 to 7,000 ft. in clear, cold water
<i>Ivesia aperta</i> var. <i>aperta</i>	SC	G2T2	S2.2	1B.2	4,500-7,500 feet, eastside
<i>Ivesia aperta</i> var. <i>canina</i>	SC	G2T1	S1.1	1B.1	meadows/seasonal drainages
<i>Ivesia sericoleuca</i>	SC	G2	S2.2	1B.2	
<i>Ivesia webberi</i>	Candidate	G2	S2.1	1B.1	4,500-6,000 feet Shallow clayey soils
<i>Lewisia cantelovii</i>	SC	G3	S2.2	1B.2	1,300-5,000 feet,
<i>Lewisia serrata</i>	SC	G2	S2.2	1B.1	westside wet

SPECIES	USFWS Status	Global Ranking	State Ranking	CNPS Status	HABITAT
					cliffs/outcrops,
<i>Lewisia kelloggii</i> ssp. <i>hutchisonii</i>	None	G4T2T 3	S2S3*	3.3*	5,100-7,000 feet, sandy granitic soil
<i>Lewisia kelloggii</i> ssp. <i>kelloggii</i>	None	G3*	S3.3*	3.3*	6,000 to 11,000 feet, gravelly or sandy flats within mixed conifer forest and subalpine forest.
<i>Lewisia longipetala</i>	SC	G2	S2.2	1B.3	8,300-9,500 feet, damp gravel
<i>Mahonia sonnei</i>	Removed		None	Rejected	Widespread in Oregon
<i>Meesia triquetra</i>	SC	G5	S3S4.2	4.2	Elevation unknown, mosses of wet meadows and fens
<i>Meesia uliginosa</i>	SC	G4	S2.3	2.2	Elevation unknown, mosses of wet meadows and fens
<i>Mielichhoferia elongata</i>	None	G4*	S2.2	2.2	Wet metamorphic rocks with heavy metals like copper
<i>Monardella follettii</i>	None	G1	S2	1B.2	2,000-6,500 feet, serpentine
<i>Penstemon personatus</i>	SC	G2	S2.2	1B.2	4,500-6,500 feet, forested areas
<i>Phacelia stebbinsii</i>	SC	G3	S3.2	1B.2	3,000-6,000 feet, westside openings
<i>Phaeocollybia olivacea</i>	None	G2	S2	None	Host – conifers, oak and tanoak
<i>Pyrrocoma lucida</i>	None	G2	3.2	1B.2	Below 6,000 feet, eastside meadows/alkali flats
<i>Tauschia howellii</i>	None	G1	S1.3	1B.3	6,000-7,500 feet, ridge tops and slopes on decomposed granite

SC = Species of Concern

Can= Candidate Species

CNPS = California Native Plant Society

\* Likely to change due to new information

The sensitive plant species that have potential habitat in the project area on the eastside of the Tahoe National Forest are as follows. The following narratives summarizes what is known about these species locally and around the world.

***Botrychium ascendens* (moonwort):** This moonwort is known to occur in Canada, Alaska, Nevada, California, and the Pacific Northwest. In California, it is known from Butte, El Dorado, Mono, Placer, Plumas, Nevada, Shasta and Tehama Counties. At this time the Lassen National Forest (NF) has 9 occurrences, the Inyo NF has 2 and Tahoe NF has 5 occurrences each, and the Modoc has 1. All occurrences are small and the numbers of this plant known to occur in California is low. This plant is found in riparian areas. Trend is unknown and hard to determine because sporophytes do not appear above ground each year. Soil disturbance is detrimental. A small amount of disturbance may be tolerated; but heavy disturbance will kill individuals. Threats include grazing and trampling by livestock and vehicle activity. Changes in hydrologic regime (from erosion, roads, grazing, etc.) are also considered threats. Hot fires have been shown to be detrimental, especially if the soil conditions are very dry during the burn.

There are five known occurrences on the Tahoe National Forest and two of those are known to occur within the Sagehen Basin. None of these occurrences were found within any of the project treatment units. However, this species is hard to find and hard to identify even with the presence of their trophophore and sporophore. These moonworts can stay dormant underground for many years: *Botrychium ascendens*, *B. crenulatum*, *B. lunaria*, *B. minganense* and *B. montanum*. Therefore, these species will be assumed to be present and Best Management Practices would be implemented to maintain the most sensitive habitat within the Riparian Conservation Areas (RCAs). See the discussion for direct, indirect and cumulative effects.

***Botrychium crenulatum* (moonwort):** This moonwort has the widest distribution of all the moonworts in the state of California, but is not common anywhere. It is limited to the western United States, scattered from California to Montana. At this time, the Lassen National Forest has 11 known occurrences, the Tahoe National Forest has eight occurrences, the San Bernardino National Forest has six occurrences (one of the San Bernardino occurrences is found on private lands), the Modoc National Forest has seven occurrences, and the Inyo National Forest has one confirmed and three unconfirmed occurrences, one of which is in Esmeralda County, Nevada, while the Plumas, Lake Tahoe Basin, Tahoe Conservancy lands and Mendocino National Forests each have one known occurrence. In addition, the Angeles National Forest has one confirmed and several historical occurrences of this species. Each occurrence often consists of only a few plants, so overall numbers in California are low. Most occurrences in California are found at moderate to high elevations. This plant is found in riparian areas. Trend is unknown and hard to determine because sporophytes do not appear above ground each year. Soil disturbance is detrimental. A small amount of disturbance may be tolerated; but heavy disturbance will kill individuals. Threats include grazing and trampling by livestock and vehicle activity. Changes in hydrologic regime (from erosion, roads, grazing, etc.) are also considered threats. Hot fires have been shown to be detrimental, especially if the soil conditions are very dry during the burn.

There are ten known occurrences on the Tahoe National Forest and five of those are known to occur within the Sagehen Basin. None of these occurrences were found within any of the project treatment units. However, this species is hard to find and hard to identify even with the presence of their trophophore and sporophore. These moonworts can stay dormant underground for many years: *Botrychium ascendens*, *B. crenulatum*, *B. lunaria*, *B. minganense* and *B. montanum*. Therefore, these species will be assumed to be present and Best Management Practices would be implemented to maintain the most sensitive habitat within the Riparian Conservation Areas (RCAs). See the discussion for direct, indirect and cumulative effects.



***Botrychium lunaria* (Common moonwort):** This moonwort is known to occur from Alaska to California, and in Arizona and the Great Lakes region. In California, it is known from Modoc (5 occurrences), Mono (one historic occurrence), and Nevada Counties. It is a CNPS list 2.3 plant with a global rank of G5. This plant is found in riparian areas. Leaves appear in the spring and die back in the latter half of summer. It grows with many other species of *Botrychium* and occasionally hybridizes with them ([www.eFloras.org](http://www.eFloras.org), February 2006). Trend is unknown and hard to determine because sporophytes do not appear above ground each year. Soil disturbance is detrimental. A small amount of disturbance may be tolerated; but heavy disturbance will kill individuals. Threats include grazing and trampling by livestock, heavy recreational use, changes in hydrologic regime (from erosion, roads, grazing, etc.), and changes in species composition. Aspen enhancement projects may impact habitat for this plant.

There are no known occurrences on the Tahoe National Forest and none are known to occur within the Sagehen Basin. None of these occurrences were found within any of the project treatment units. However, this species is hard to find and hard to identify even with the presence of their trophophore and sporophore. These moonworts can stay dormant underground for many years: *Botrychium ascendens*, *B. crenulatum*, *B. lunaria*, *B. minganense* and *B. montanum*. Therefore, these species will be assumed to be present and Best Management Practices would be implemented to maintain the most sensitive habitat within the Riparian Conservation Areas (RCAs). See the discussion for direct, indirect and cumulative effects.

***Botrychium minganense* (Mingan moonwort):** This moonwort is known to occur from Alaska throughout boreal Canada, southward into all of the western mountain states to Arizona, and eastward along the northern states to the Atlantic Canadian Provinces and New England. In California, it is known from Butte, Fresno, Modoc, Nevada, Plumas, Shasta and Tehama Counties. It is a CNPS list 2.2 plant (rare in California and considered fairly endangered in California) with a global ranking of G4. All occurrences are small and the numbers of this plant known to occur in California is low. This plant is found in riparian areas. Trend is unknown and hard to determine because sporophytes do not appear above ground each year. Soil disturbance is detrimental. A small amount of disturbance may be tolerated; but heavy disturbance will kill individuals. Threats include grazing and trampling by livestock and vehicle activity. Changes in hydrologic regime (from erosion, roads, grazing, etc.) are also considered threats. Hot fires have been shown to be detrimental to *Botrychium* species, especially if the soil conditions are very dry during the burn.

There is only one known occurrence on the Tahoe National Forest and none are known to occur within the Sagehen Basin. None of these occurrences were found within any of the project treatment units. However, this species is hard to find and hard to identify even with the presence of their trophophore and sporophore. These moonworts can stay dormant underground for many years: *Botrychium ascendens*, *B. crenulatum*, *B. lunaria*, *B. minganense* and *B. montanum*. Therefore, these species will be assumed to be present and Best Management Practices would be implemented to maintain the most sensitive habitat within the Riparian Conservation Areas (RCAs). See the discussion for direct, indirect and cumulative effects.

***Botrychium montanum* (moonwort):** This moonwort is known to occur in from British Columbia, California, Montana, Oregon, and Washington. In California, it is known from Butte, Modoc, Nevada, Plumas, Shasta and Tehama Counties. At this time the Lassen National Forest (NF) has 11 occurrences, and the Modoc and Tahoe NFs have one occurrence each. All occurrences are small and the numbers of this plant known to occur in California is low. This plant is found in riparian areas. Trend is unknown and hard to determine because sporophytes do not appear above ground each year. Soil disturbance is detrimental. A small amount of disturbance may be tolerated, but heavy disturbance will kill individuals. Threats include grazing and trampling by livestock and vehicle activity. Changes in hydrologic regime (from erosion, roads, grazing, etc.) are also considered threats. Hot fires have been shown to be detrimental, especially if the soil conditions are very dry during the burn.

There are no known occurrences on the Tahoe National Forest and none are known to occur within the Sagehen Basin. There are not any occurrences found within any of the proposed project treatment units. However, this species is hard to find and hard to identify even with the presence of their trophophore and sporophore. These moonworts can stay dormant underground for many years: *Botrychium ascendens*, *B. crenulatum*, *B. lunaria*, *B. minganense* and *B. montanum*. Therefore, these species will be assumed to be present and Best Management Practices would be implemented to maintain the most sensitive habitat within the Riparian Conservation Areas (RCAs). See the discussion for direct, indirect and cumulative effects.

***Bruchia bolanderi* (Bolander's candle moss):** This moss is endemic to California and Oregon (Rushing 1986, Christy and Wagner 1996). California populations are known from Fresno, Tehama, Madera, Mariposa, Nevada, Tuolumne, Tehama and Plumas counties (UC Berkeley Herbarium specimens, CNPS 2001). The California Native Plant Society (CNPS) considers this moss fairly endangered in California and rare outside of California (CNPS 2001). In the Sierra Nevada, it is known from fewer than 10 occurrences from Yosemite National Park south to Sequoia National Forest in Tulare County.

*Bruchia bolanderi* grows on moist soil, often along exposed edges of streams through meadows or in exposed and disturbed soils or under grasses; sometimes partially shaded by coniferous forests. It grows from 1200 to 2800 meters (about 4000 to above 9000 feet). The abundant production of spores provides ample dispersal opportunities. The species is opportunistic, taking advantage of disturbed sites and minimal competition from other vegetation (Christy and Wagner 1996). However, sporophytes are infrequently encountered in many California populations. The ephemeral nature of this species and its occurrence in disturbed sites allows some flexibility in management (Christy and Wagner 1996). The species is difficult to identify without a sporophyte, which may make surveys for this species problematic.

This plant has been found on the TNF, in the Castle Valley area. Trend is not determined, however, increased survey efforts have increased the number of known occurrences. No population monitoring has occurred. Potential threats include direct impacts from cattle or other management activities that directly damage the plants. Note that this species appears capable of reestablishing itself in recently disturbed soils.

There is just one known occurrence on the Tahoe National Forest and none of those are known to occur within the Sagehen Basin. None of these occurrences were found within any of the project treatment units. However, this species is hard to find and hard to identify without the presence

of sporophytes. This species would be assumed to be present. See the discussion for direct, indirect and cumulative effects.

***Cudonia monticola* (Large Cudonia):** This fungus is found under conifers in northern California and the Pacific Northwest. It is considered endemic to northwestern North America and is known from northern Washington, the Cascade Range, mountains of southern Oregon. In California it is known to occur on the Coast Range, in the Klamath Mountains, and northern Sierra Nevada Mountains. It has been found on the TNF in the Yuba Pass area in a campground. It is usually found in the spring or summer scattered or in dense groups, growing in humus, soil, and on rotting wood (Arora 1986). It is a Basidiomycete that is a saprophyte-decomposer. It is assumed that it is ectomycorrhizal (ECM) and that it has a broad host range including various members of the Pinaceae family. It is an epigeous ECM that is probably located within the top few centimeters of the soil. It is generally found in mature, moist coniferous forests. It has no adaptations to desiccation from loss of humidity in its micro-climate. General trends are unknown. Threats are evaluated in terms of negative impacts to the fungal mycelium and include any management activity that would significantly disturb the litter/duff/soil organics directly or indirectly. Ground-disturbing activities that reduce the amount of rotting wood and interrupt the addition of fresh wood to rot would impact this species. Other threats include activities that alter the humidity, light patterns and composition of its habitat.

There is one herbarium report that this fungi was found to occur up at the top of Yuba Pass. It has not been found to occur within the Sagehen Basin nor is it known to occur within any of the proposed treatment units. Although no effects are expected, it is very hard to know whether this species may be present in the soil. This species of fungi will be assumed to be present. See the Cumulative Effects Section for discussion on potential impacts to fungi.

***Epilobium howellii* (subalpine fireweed):** *Epilobium howellii*, when first described, was known from a total of 4 occurrences, ranging from Yuba Pass in Sierra County in the north, south to Fresno County in the Huntington Lake area, and east to Mono County. Recent survey efforts have increased the occurrence numbers to more than 100, based on a ¼ mile separation criterion (USDA 2009). Now, the known range extends from Yuba Pass on the Tahoe National Forest (NF), south through Sierra, Nevada, El Dorado, Alpine, Tuolumne, Mono, Madera and Fresno Counties (USDA 2009). The majority of occurrences are located on the Sierra NF. Population size in terms of individual plants, based on available records, range from very small, with as few as 3-5 individuals, up to 1,000,000 (USDA 2009). Due to the discovery of over 100 new occurrences over the past 5 years, CNPS has recently changed the status for this species from List 1B.3 to List 4.3 (CNPS 2009).

The subalpine fireweed grows in margins of moist meadows and mossy seeps in subalpine coniferous forest, i.e. the meadow and seep guild. Threats due to management activities include road maintenance, recreational trampling, off-highway vehicle use, livestock grazing and trampling, and any other activity that would alter the flow and/or amount of water in wet meadows and mossy seeps.

Eleven occurrences have been found on the Tahoe National Forest, but none of those has been documented within the Sagehen Basin or proposed treatment units. Therefore, actions associated with Alternatives 1, 2 and 3 would not be expected to affect this species or habitat, and no further analysis is needed.

***Eriogonum umbellatum* var. *torreyanum* (Donner Pass buckwheat):** This plant is a perennial sub shrub forming large prostrate mats with glabrous leaves. The current known distribution of this buckwheat is a thin 34-kilometer long, 2-6 kilometer wide band along the eastern side of the Sierra Crest from Webber Mountain in the north to Silver Peak, just north of Squaw Valley in the south. Most plants occur in Placer and Nevada Counties, and 2 occurrences occur in Sierra County. The species is known from highly erosive volcanic soils (meiss) with sparse vegetation at 6,000 – 8,200 feet elevation in open subalpine habitats on shallow soil typically on steep east-facing slopes (Kan 1990). It occurs on the TNF where approximately 7,000 individual plants are scattered through sixteen occurrences. It has not been assigned to a guild. Initial evaluation of trend indicates a lack of stability, i.e. decline. Threats include mining, ski area development, livestock grazing and trampling (sheep), timber harvest and related activities, and other development.

Twenty occurrences have been found on the Tahoe National Forest, but none of those has been documented within the Sagehen Basin or proposed treatment units. Therefore, actions associated with Alternatives 1, 2 and 3 would not be expected to affect this species or habitat, and no further analysis is needed.

***Helodium blandowii* (Blandow's bog-moss):** *Helodium blandowii* is known from Europe, Asia and across northern United States from New Jersey and Ohio west to California and Nevada, and northwards to Canada (Flowers 1973). In California, it is known from Kings Canyon National Park in Fresno County and from the Inyo and Klamath NFs. It is also known from the Mount Rose area on the Nevada side of Lake Tahoe (Shevock collection), i.e. at Tahoe Meadows, along Ophir Creek on the Toiyabe side of the LTBMU. It grows in wet meadows and seeps in subalpine coniferous forest and alpine lakes (Flowers 1973). Trend is unknown. The two most critical factors affecting the abundance and distribution of species such as *Helodium blandowii* are hydrology and the nutrient concentration of incoming water. Changes in hydrology can occur through road or trail construction/maintenance/use.

There are no known occurrences on the Tahoe National Forest and none are known to occur within the Sagehen Basin. There are not any occurrences found within any of the proposed project treatment units. Therefore, actions associated with Alternatives 1, 2 and 3 would not be expected to affect this species or habitat, and no further analysis is needed.

***Hydrothyria venosa* (lichen):** *Hydrothyria venosa* (now called *Peltigera hydrothyria*) is known from the mountains of western North America and the Appalachians in eastern North America. It grows on rock (occasionally on wood); in small, clear, cold streams and springs where it is submerged throughout most of the year (McCune et al. 2006). Its elevational range is about 1,150 to 7,000 feet. There are at least 89 known sites on federal lands in Washington to California. There are four known sites on the PNF. Although it has a broad distribution, its distribution is limited to isolated site clusters. It is considered rare throughout its Western range (McCune et al. 2006). Trend is unknown. Perennial water sources with little seasonal variation in water levels provide habitat. Threats include any activity that would kill or damage the habitat component of clear water.

There are no known occurrences on the Tahoe National Forest and none are known to occur within the Sagehen Basin. There are not any occurrences found within any of the proposed project treatment units. Therefore, actions associated with Alternatives 1, 2 and 3 would not be expected to affect this species or habitat, and no further analysis is needed.

***Ivesia aperta* var. *aperta* (Sierra Valley Ivesia):** *I. aperta* var. *aperta* is known from Plumas, Sierra, and Washoe and Storey Counties in California and Nevada. The majority of occurrences in California are located in the Sierra Valley area. Most of the known occurrences (29) are located on California state, BLM and private land. This plant is found at meadow edges, in ephemeral stream channels, in meadow flats, and on gentle, rocky up-slopes near springs. It occurs in sagebrush plant communities at the floor of the eastern Sierra Nevada Mountains. The hydrology of these habitats is easily changed, and they are prone to rapid erosion. This plant is assigned to the meadow/seep, ephemeral wet, and riparian woodland guilds. This plant appears to be in decline across its range. Threats from management activities include livestock grazing, road construction and maintenance, mining, fire suppression activities (fire camps), and off-road vehicle use. Occurrences on private lands are threatened by habitat conversion, etc. The Tahoe, Plumas, and Humboldt-Toiyabe NFs have a conservation strategy in place for management of this plant. The most common management prescription is for protection from direct and indirect impacts.

*Ivesia aperta* var. *aperta* exists in less than ten locations on the Sierraville Ranger District within and around the fringes of Sierra Valley. Several other locations occur on private land within Sierra Valley. No *Ivesia aperta* var. *aperta* was found. Surveys were done during July, August and September when *Ivesia aperta* var. *aperta* has been found elsewhere. Therefore, actions associated with Alternatives 1, 2 and 3 would not be expected to affect this species or habitat, and no further analysis is needed.

***I. aperta* var. *canina* (Dog Valley Ivesia):** *I. aperta* var. *canina* is known only from the Dog Valley area, Humboldt-Toiyabe National Forest, in Sierra County. This location is about 2 miles from the eastern boundary of the Tahoe NF. The habitat for this plant appears to be similar to Sierra Valley Ivesia. The Humboldt-Toiyabe NF has developed a conservation strategy agreement with the United States Fish and Wildlife Service (USFWS). This conservation agreement outlines management plans for keeping this plant from being listed as threatened or endangered. This plant is assigned to the ephemeral wet guild. The trend appears to be down based on the need for a conservation agreement. Threats from management activities include livestock grazing, off-road vehicle use, recreation activities, mining, prescribed fire, timber harvest support activities, reservoir proposals, and any other activities that would change the hydrology of the area.

No known *Ivesia aperta* var. *canina* exists on the Tahoe National Forest or within the Sagehen Basin. Therefore, actions associated with Alternatives 1, 2 and 3 would not be expected to affect this species or habitat, and no further analysis is needed.

***Ivesia sericoleuca* (Plumas Ivesia):** This plant is found in the ephemeral wet parts of meadows and alkali flats, and in vernal pools. These habitats are not widespread and are sensitive to changes in hydrology and to erosion. It is known to occur on National Forest system and private lands in Plumas, Placer, Sierra, and Nevada Counties in California and Washoe and Storey Counties in Nevada. It is assigned to the meadow/seep and ephemeral wet guilds. The current trend is not known. Threats from management activities include recreation activities, off-road vehicle use, fuel wood gathering, target shooting, livestock grazing, mining, fire suppression camps, military practice camps, timber harvest activities such as landings, road building and maintenance, land exchange, wildlife introduction (turkeys), and any activity that changes the hydrology and/or increases erosion. The Tahoe, Plumas, and Humboldt-Toiyabe

NFs have a conservation strategy in place for management of this plant. The most common management prescription is for protection from direct and indirect impacts.

*Ivesia sericoleuca* exists in 28 locations on the Tahoe National Forest. Many of those are within and around the fringes of Sierra Valley and other various areas near Kyburz Flat, Boca Reservoir and Secret Meadow. Several other locations occur on private land within Sierra Valley and on the eastside of the Plumas NF and the western portion of the Humboldt-Toiyabe NF. Suitable habitat within the sagebrush flats on the edge of forested areas within the Sagehen Project Area has been surveyed by biological technicians trained in the identification of these species. One occurrence of *Ivesia sericoleuca* is known to occur outside of the proposed units near Sagehen Field Station, but is on the periphery of the project area where it would not be directly or indirectly impacted by project related activities.

***Meesia triquetra* (moss):** In California, there were 74 occurrences with the majority in the Sierra Nevada Mountains discovered since 1980 (Dillingham, 2005). Occurrences are known from Sierra, Sequoia, and Tahoe NFs and Sequoia National Park. This moss seems to prefer acidic meadows with *Sphagnum* (moss), *Drosera* (sundew), and *Vaccinium* (huckleberry) associates. The presence of cold water fed springs in the meadow also seems to be essential. It requires permanent saturation and is not found in meadows that dry out. It is assigned to the bog and fen and meadow and seep guilds. The elevation range is unknown. The overall trend for this moss is that it is in decline. Few meadows in the southern Sierra have this moss. It may be extremely sensitive to alterations in meadow hydrology. Threats from management activities are any that change the hydrology of meadows; i.e. timber harvest, livestock grazing, road construction, construction of fuel breaks, recreation activities, etc. Collection may also be a threat.

The area was surveyed by biological technicians trained in the identification of these species. Surveys were done during July, August and September when *Meesia triquetra* have been found elsewhere. Twenty-six occurrences have been found on the Tahoe National Forest, 13 of those have been documented within the Sagehen Basin and two were documented to be present within proposed treatment units 46 and 98. The fens where *M. triquetra* occurs would be buffered from direct effects by the placement of Dense Cover Areas (DCA) in unit 98. *Meesia triquetra* occurs in a relatively open area in unit 46 where the only potential treatment under Alternatives 1 and 3 would be that prescribed fire may be allowed to creep into the buffer, not the fen where the *M. triquetra* resides.

***Meesia uliginosa* (moss):** The range for this moss is disjunct, but in California it is known to occur from Siskiyou County south to Tulare County. *M. uliginosa* is known from about 16 collections in California with the majority in the Sierra Nevada Mountains (Dillingham, 2005). Populations of *M. uliginosa* are reported to be small and infrequently encountered. Most known occurrences are located in the southern Sierra Nevada. This moss grows in permanently wet, primarily spring fed meadows. These meadows are generally in the upper levels of mixed conifer to subalpine forests. Occurrences are not restricted to a particular meadow type. This moss is assigned to the bog and fen and meadow and seep guilds. The elevation range is unknown. The trend is in decline since several historic sites have not been relocated and/or the habitat has been degraded. Threats from management activities are any that change the hydrology of meadows; i.e. timber harvest, road construction, construction of fuel breaks,

recreation activities, etc. Collection and range grazing allotments may also be a threat. In 2004, an additional 5 occurrences of *M. uliginosa* were found on the Tahoe National Forest.

The area was surveyed by biological technicians trained in the identification of these species. Surveys were done during July, August and September when *Meesia uliginosa* has been found elsewhere. Thirty-one occurrences have been found on the Tahoe National Forest, 14 of those have been documented within the Sagehen Basin and three were documented to be present within proposed treatment units. The fens where the *Meesia uliginosa* occurs would be buffered from direct effects by the placement of Dense Cover Areas (DCA) in unit 98 and occurs in relatively open areas in unit 46. No direct effects from activities associated with Alternatives 1, 2 and 3 are anticipated as a result of project implementation within either of these proposed units because the soil and logs are saturated within the fen habitat and are unlikely to burn.

### **III. ENVIRONMENTAL EFFECTS**

#### **A. Alternative 1 and 3**

##### **Direct Effects Sensitive Plants with Potential Habitat or Present**

Sagehen Basin has been known for having a high concentration of fens of many sizes and shapes. Fens are peat-forming wetlands that rely on groundwater input and require thousands of years to develop and cannot easily be restored once destroyed (Weixelman and Cooper, 2009). Fens are also hotspots of biodiversity (ibid). They are often home to rare plants, insects and small mammals (ibid). Fens provide potential habitat for many of the for many of the Tahoe National Forest sensitive plant species such as moonworts *Botrychium ascendens*, *B. crenulatum*, *B. lunaria*, *B. manganense*, *B. montanum*, mosses *Bruchia bolanderi*, *Helodium blandowii*, *Meesia triquetra* and *M. uliginosa*. All of the large fen areas that occur inside the Sagehen Basin occur outside of the units proposed for treatment. However, a few small fens occur within units proposed for treatment. *Ivesia sericoleuca* occurs within the Sagehen Basin outside of the fen habitat and away from units proposed for treatment. There is potential for the fungi *Cudonia monticola* to be occasionally occurring in the soil especially in red and white fir forested areas that have remained free from disturbance for several years.

Approximately 53 acres of fens occur within the Sagehen Basin, of those, nine acres occur within units proposed for treatment under Alternative 1 and Alternative 3. That leaves about 44 acres (83 percent) of the fen area that would remain outside any units that have proposed treatments for any reason within the Sagehen Basin. Although the fen area that occurs within units 98 and 46 remain the same between Alternative 1 and 3, the potential for direct effects would be reduced proportionally by the reduced acres of treatment proposed in Alternative 3 that would be implemented inside Riparian Conservation Areas (RCAs) of Special Aquatic Features. The treatments are meant to minimize disturbance of riparian vegetation and soils by implementing no treatment or using hand methods in the most sensitive areas, maintaining higher tree densities along perennial streams, restricting pile locations, restricting equipment use, and requiring underburning at lower intensities. RCA widths are measured in horizontal distance on both sides of streams.

Of the Tahoe NF sensitive plants, only *Meesia triquetra* and *M. uliginosa* have been found to occur within two units that include fens. These two occurrences of *Meesia triquetra* and three *M. uliginosa* occurrences were found within the relatively small fens within units 46 and 98. Two *Botrychium ascendens* and *B. crenulatum* have been found to occur in close proximity to three other units proposed for treatment within the Sagehen Project Area. *Ivesia sericoleuca* has

been found outside one unit, but the occurrence would be avoided entirely. Although, adequate botanical surveys have been performed within the project area by trained botanists, it is possible that additional isolated individuals may possibly be present because these plants are either very small or may remain living under the soil surface for many years before appearing above ground as moonworts often do. These moonworts and mosses especially are dependent on fens and fen margins or perennially wet floodplains or meadows.

The potential for direct effects to riparian dependent sensitive plant species can be measured by comparing the acreage of habitat that would be affected by proposed activities. The acreage of treatments within the Riparian Conservation Areas (RCA) included in the Sagehen Project proposal are summarized in the Riparian Conservation Objective Analysis (Attachment 4). Treatments for riparian areas were suggested by GTR 220 and were designated as emphasis areas 2 and 4. Emphasis areas 2 and 4 include perennial stream courses and other intermittent and ephemeral drainages throughout the Basin. These locations tend to be relatively more mesic, retain moisture longer through the season and generally support more dense and diverse vegetation conditions than the surrounding stands. The Sierra Nevada Plan Amendment Final Environmental Impact Statement (FEIS) Appendix AA refers to the definition of RCA provided in the Sierra Nevada Ecosystem Project definition which says “Riparian areas are considered water dependent lands along streams and lakes where transitions occur between terrestrial and aquatic parts of a watershed.”

Approximately 229.5 acres of proposed treatment around Special Aquatic Features (fens, meadows and springs) within the Management Zone RCA has been proposed for treatment within Alternative 1- units. Of the 229.5 acres, approximately 159 acres would be mechanically treated. Treatments include thinning and fuels treatments, and restoration activities. Approximately 124 acres of proposed treatment around Special Aquatic Features (fens, meadows and springs) within the Management Zone RCA has been proposed within Alternative 3 units. Of the 124 acres, approximately 55.1 acres would be mechanically treated. Treatments include thinning and fuels treatments, and restoration activities. These treatments would be implemented inside Riparian Conservation Areas (RCAs) as described in the Riparian Conservation Objective Analysis for the Sagehen Project but not within the aquatic features themselves.

Units 46, 85 and 98 include eight fen complexes that have potential habitat for riparian dependent sensitive species. The one of the two fens in unit 98 is located in the middle of the unit and is of high quality and in relatively good condition with known sensitive plant occurrences of *Meesia triquetra* and *M. uliginosa*. The fen complex in unit 46 is in the north-central portion of the unit and is surrounded by a plantation that was planted after the Donner Burn in 1960. This fen in unit 46 also contains *M. triquetra* and *M. uliginosa*. The five fens in 85 are scattered across the unit and are in a relatively poor or degraded condition. “Flag and Avoid” mitigations are being included to prevent the removal of trees whose roots are contributing to the stabilization of the boundaries of the fen and to keep tractors from operating within 25 feet of the fens should be posted with “tractor keep out signs”. Mitigations are intended to maintain the water level so that soils remain saturated in the fens to preclude conditions that cause accelerated aerobic decomposition of the peat. The relatively pristine fens within unit 98 would be incorporated into the Density Cover Area (DCA) network to prevent any activities to occur close to the fen boundary.

Under these circumstances, *Botrychium ascendens*, *B. crenulatum*, *B. lunaria*, *B. minganense*, *B. montanum*, *Bruchia bolanderi* and *Helodium blandowii*, must be assumed to be present and



*Meesia triquetra* and *M. uliginosa* have been found to be present. Any undiscovered individuals may be impacted inadvertently, but direct effects are expected to be avoided or reduced to a low level because the best habitat for many of these species exists within the fens. These fens would have 25 foot TKO protection buffers where trees whose roots contribute to the fortification of the edge of the fen or contribute to the carbon balance would remain in place. The Standard Management Requirements include the Best Management Practices that are listed in the Sagehen Standard Management Requirements in Appendix A and have been designed to meet the Riparian Conservation Objectives in general, but also minimize impacts to sensitive plant habitat.

It is also intended that these mitigations meet the RIPARIAN CONSERVATION OBJECTIVES (RCO) #2 and #4.

#2: Maintain or restore: (1) the geomorphic and biological characteristics of special aquatic features, including lakes, meadows, bogs, fens, wetlands, vernal pools, springs; (2) streams, including in stream flows; and (3) hydrologic connectivity both within and between watersheds to provide for the habitat needs of aquatic-dependent species. (RCO #2 is linked to the following AMS goals: #2: Species Viability; #3: Plant and Animal Community Diversity; #4: Species Habitats; #5: Watershed Connectivity; #6: Floodplains and Water Tables; #8: Stream flow Patterns and Sediment Regimes; #9: Stream banks and Shorelines).

#4: Ensure that management activities, including fuels reduction actions, within RCAs and CARs enhance or maintain physical and biological characteristics associated with aquatic- and riparian-dependent species. (RCO #4 is linked to the following AMS goals: #2: Species Viability; #7: Watershed Condition)

### **Direct Effects to sensitive plant habitat in unit 85 due to Aspen restoration**

Due to fire exclusion, some aspen stands in the Sagehen Basin have been overtopped by conifers. Thus these stands have a higher percentage of conifers compared to aspen, and have very little regeneration of aspens due to over-shading. Aspen habitat is particularly important for biological diversity and is limited across the landscape. Actions to restore aspen stands within unit 80 and 85 boundaries would help to enhance and perpetuate these highly diverse habitats over the long term.

Direct or indirect effects to *Botrychium ascendens*, *B. crenulatum* and the other sensitive *B.* species, *Meesia triquetra* and *M. uliginosa* would not be expected since these moonwort and moss species are not known to occur within the fens in unit 85. No direct treatments are planned to occur in the fens and a 25 foot TKO buffer around the fens would help to keep the margins intact and would reduce the likelihood of impacts to the conditions within these fens from the proposed treatment activities associated with Alternative 1. This unit would not be treated under the Alternative 3 proposal and so no direct or indirect effects would be expected from activities associated with Alternative 3.

The aspen stand restoration activities within ephemeral wet areas would have potential to affect species that are found more often in aspen habitat such as *Epilobium howellii*. Aspen stand restoration if done as described in this project proposal would serve to meet the objectives of maintaining or restoring the diversity and productive nature of native plant communities in the riparian zone. These aspen stands in units 80 and 85 have been surveyed and no *Epilobium howellii* was found to occur within any of the aspen restoration stands proposed for treatment.

Chances of direct effects to *Epilobium howellii* are low since none were found to occur. Aspen stands supported more plant species overall and more unique plant species than either meadow or conifer communities (Kuhn et al. 2011). Aspen stand treatments may increase the diversity of plants growing in the understory by allowing extra water and sunlight to be available for understory species.

**Direct effects to sensitive fungi species:**

*Cudonia monticola* is a fungus that has potential to occur within old forest stands within the Sagehen Project area. *Cudonia monticola* is not known to occur within the Sagehen Project area. Surveys for fungi species are generally not performed because fungi don't always put up fruiting bodies. Most of the time, fungi species reside in the soil in the form of mycelium that are invisible to the naked eye (Arora, 1986). Acreages of untreated old forest in the same catchments or watersheds are expected to provide habitat for these fungi species if they are present. An analysis was performed by running queries of California Wildlife Habitat Relationships (CWHR) (USDA, 1988) types within the project area. Acreages of CWHR types 5M, 5D with dominant tree species of red fir, white fir, Jeffrey pine, ponderosa pine, lodgepole pine and western white pine were queried to estimate amount of potential habitat for the sensitive fungi *Cudonia monticola*.

It was determined that suitable stands for fungi to remain viable would be those stands that have gone long periods of time without disturbance and would be undisturbed in the foreseeable future. These forested stands would contain medium to large trees with a high canopy cover that would provide a sufficient depth of organic matter for this fungus to be present within the upper elevations and Protected Activity Centers (PAC) within the Sagehen Project area. Stands that would provide habitat would have Jeffrey pine, white fir, red fir and lodgepole pine. These stands would remain undisturbed, and maintain moderate to dense tree and ground cover. These stands that could provide suitable habitat and add up to about 1,500 acres of untreated forest. The emphasis areas 1, 2, 4 and 5 are most likely to have a moderate to high potential for *Cudonia monticola* habitat since they occur on north-facing slopes, higher elevations or drainage bottoms where more organic matter typically occurs within the soil and where there is a prevalence of red fir and white fir trees. The potential habitat that is proposed for treatment within Emphasis areas 1, 2, 4, and 5 would be about 1,757 acres in Alternative 1. This number represents about 54 percent of the potential habitat is proposed for treatment within the Sagehen Basin. Therefore, about 46 percent of the potential habitat for *Cudonia monticola* other fungi would still be maintained to provide viable presence under Alternative 1. Key soil functions including nutrient cycling that are performed by fungi can be maintained by avoiding the best potential habitat and implementing the management standards that protect soil productivity. See the Soil and Watershed Cumulative Effects Assessment.

Even fewer acres would be proposed for treatment under Alternative 3 would include about 247 acres that could be considered habitat for *Cudonia monticola*. The proposed units for treatment represent about eight percent of the estimated total acres of potential habitat which has been determined to be 3,257 acres.

The rare fungi have been added to the Forest Service sensitive list because fungi facilitate many aspects of ecological function such as nutrient cycling by decaying rotten wood, duff and litter, so it is important to provide for their existence. The TNF has about 353,631 acres of older forest

(NFS lands CWHR 4 and above) (Van Zuuk 2009) and these areas could represent the best potential habitat for fungi species and others. Much of these areas exist in places where little soil disturbing management is planned to occur such as the Roadless Areas, Granite Chief Wilderness, spotted owl Protected Activity Centers (PACs) and goshawk PACs. According to the Tahoe National Forest GIS data, there are approximately 197,462 acres within Roadless Areas. The Granite Chief Wilderness has approximately 25,268 acres that is contained within one of the Roadless Areas. The spotted owl PACs add up to about 57,406 acres and the goshawk PACs add up to about 21,045 acres on the Tahoe of which approximately 9,210 acres occur within Roadless Areas. This analysis suggests that there exists a sufficient amount of acreage that contains undisturbed thick duff or moss layers and rotting wood where the humidity remains high, where *Cudonia monticola* can exist and spread. Fungi species are not covered under the Endangered Species Act. Since fungi species are not included under the ESA, no determination pertaining to their listing is relevant.

Therefore, actions associated with Proposed Action Alternatives 1 and 3 could have limited potential of directly impacting *Cudonia monticola*, its habitat and mycelium network that may be occurring in the soil. Project implementation would not produce adverse effects to the soil that provides good habitat for *Cudonia monticola* because the best habitat exists in within Roadless Areas, Protected Activity Centers (PACs) and Wilderness Areas that have seldom been affected by timber harvest. These undisturbed stands occur within the Sagehen basin and across the Tahoe National Forest.

### **Effects of Sporax Application**

The application of Sporax (borax) to the freshly cut stumps of conifers would be performed to guard against the spread of annosus root rot that is naturally occurring fungus in white fir and pine communities. The application of Borax may impact especially those plants such as the *Botrychium* spp. (moonworts) that have strong mycorrhizal requirements and the fungi species (*Cudonia monticola*), because Sporax is a fungicide. Root systems of native plants are commonly colonized by one or more [mycorrhizal fungi](#) that are naturally occurring soil fungi which increase nutrient absorption and improve soil structure ([Augé](#) 2008). *Botrychium* spp. exist within a microhabitat that extends a couple of meters, so changes in light and moisture within a couple of meters may affect the plant's ability to survive. Other studies have shown that when herbicides are applied to moonworts, the individual plants that are hit die, but plants 5 cm away that were not hit live (Johnson-Groh, 2008). The adjacent underground plants would not be likely impacted depending on the translocation of the Sporax underground (ibid). Other aspects associated with the application of Sporax would be the toxicity to beneficial fungi and the desiccation where Sporax would be applied (ibid). Large amounts of Sporax (borax) can be toxic to plants and microorganisms; boron (the main break-down product of borax) is a naturally occurring element that plants need. Terrestrial plants are normally rich sources of boron and boron is an essential trace element for higher plants (Eisler 1990). The application of Sporax would be carefully applied to tree stumps only to specifically prevent the spread of annosus root rot from stump to adjacent live trees. Since all mitigation that reduce the likelihood that Sporax would get into the water and trees would not be removed from within the fens or on the edges of the fens, the potential for Sporax application to directly affect the sensitive plants associated with fens would be minimal.

### **Direct Effects Sensitive Plant Species ruled out:**

Direct effects are not expected for those species that have little or no potential habitat within the Sagehen Basin. An evaluation was performed using existing information that determined that no potential habitat occurs within the Sagehen Project area for many other sensitive plants species that are known to occur or have potential habitat on the eastside of the Tahoe NF or on adjacent National Forest system lands. These species are *Boechera rigidissima* var. *demota*, *Erigeron miser*, *Ivesia webberi*, *Lewisia kelloggii* spp. *hutchisonii*, *Lewisia kelloggii* spp. *kelloggii*, *Lewisia longipetala*, *Pyrrocoma lucida* and *Tauschia howellii*. None of these sensitive plant species were found to within the Sagehen Project during surveys and there were no other unexpected sensitive plant species found.

*Eriogonum umbellatum* var. *torreyanum*, *Epilobium howellii*, *Hydrothyria venosa*, *I. aperta* var. *aperta* and *I. aperta* var. *canina* have not been found, although the suitable habitat within the project area have been surveyed by biological technicians trained in the identification of these species and no plants were found. Surveys were done during July, August and September when these species have been found elsewhere. Since these species are relatively large and easy to find, it is assumed that it is not present within the project area. *Ivesia sericoleuca* has been found, but occurs on the peripheral edge of the project area and where direct effects can be totally avoided. It would be flagged on the ground according to normal flag and avoid mitigations to prevent direct effects, if necessary.

### **Indirect effects:**

#### **Removing trees within the RCA around the fens**

The following fen mitigations have been added to the project proposal in order to satisfy the Riparian Conservation Objectives (RCO). The California Regional Water Quality Control Board (LRWQCB, 1998) for the Lahontan Region sets water quality standards and objectives for these watersheds. The State and Regional Boards entered into an agreement with the U.S. Forest Service (USFS) which requires the agency to control non-point source discharges by implementing the measures certified by the State Board as Best Management Practices (BMPs). BMPs are incorporated into the Standard Management Requirements SMRs and are designed to protect water quality and are designed to minimize the disturbance of riparian vegetation and soils by implementing no treatment or using hand methods in the most sensitive areas, maintaining higher tree densities along perennial streams, restricting pile locations, restriction of equipment use, restricting group selection harvest and requiring underburning at lower intensities.

1. Fen areas are located within units 46, 85 and 98 and downstream from units 61 and 163. Other units with fens in close proximity are units 80 and 99. Five fens without known sensitive plant occurrences are located in unit 85. Implement a 25' Tractor Keep Out (TKO) along the periphery of all fens in these areas. The silviculturist will work with the botanist and hydrologist or soil scientist to extend this no treatment zone outside the fen area to areas needed to maximize protection of the fens. No trees would be removed, where trees contribute to the stability of the fen border as determined by the botanist to be necessary to retain the ecological/hydrological integrity of the fen. The silviculturist will guide the marking to assure the noted area is not

affected by the surrounding silvicultural treatment. This no treatment zone will be complemented by the standard 25' (or greater) TKO (Tractor Keep Out) that is implemented around every water feature to prevent mechanical equipment such as tractors, skidders and feller-bunchers from entering sensitive riparian areas. More information about this TKO is described in SMR 2, 5 and 25.

SMR 25 is designed to protect the fens and maintain the water table level within the fen. All occurrences of sensitive plants, including all found at a later time, should be flagged and no ground-disturbing activities should be implemented within the flagged areas. When sensitive plant occurrences are found within fens, the whole fen should be protected and so trees whose roots contribute to the integrity of the fen border shall be retained and the 25 foot TKO would also apply. Monitoring should take place during project activities and directly after project activities culminate in the vicinity of sensitive plant occurrences to ensure protective measures are sufficient. If impacts to a sensitive plant occurrence are detected, monitoring should take place to determine whether or not the occurrence is still extant (has not been extirpated) and to determine whether impacts will have lasting adverse effects. When Sensitive Plant occurrences are found within fens, the whole fen should be protected and so trees whose roots contribute to the integrity of the fen border shall be retained and the 25 foot TKO would also apply.

These mitigations would reduce the likelihood that fens would be prone to dewatering which would lead to the degradation of the fen and the known occurrence of *Meesia triquetra* and *M. uliginosa* and potentially unknown occurrences of the other riparian dependent sensitive plant species such as the moonworts *Botrychium ascendens*, *B. crenulatum*, *B. lunaria*, *B. minganense*, *B. montanum*, the mosses *Bruchia bolanderi* and *Helodium blandowii*. See SMR # 25.

The indirect effects of the removal of trees around the fens in these 46, 85 and 98 units would not cause detrimental impacts to the sensitive moss species (*Meesia triquetra* and *M. uliginosa*) known to occur in these fens because the mitigations including the buffer of 25 feet would be sufficient to prevent indirect impacts such as the potential for dewatering of the fens.

### **Threat of noxious weed invasion**

One potential indirect effect is an increase in noxious weeds or other undesirable non-native species as a result of project activities. "A", "B" and "C" rated of California Department of Food and Agriculture listed noxious weed species have been found to occur in close proximity to any of the proposed units or sensitive plant sites in the Sagehen Project Area. There are two known locations of the "A" rated noxious weed *Carduus nutans* (musk thistle) that have been identified as occurring within close proximity to the Sagehen project area. The nearest occurrence of musk thistle is known from the roadside near Phoenix Sale landings near Sagehen Summit and Bickford Ranch. These occurrences have been treated aggressively by hand pulling and are not expected to spread to timber units within the Sagehen Project area. The "B" rated (tall whitetop) has also been found to occur on the roadside near Bickford Ranch. The "C" rated noxious weed species such as bull thistle, common mullein and salsify were found on the in

several disturbed areas, such as tilled landings created by other projects. These noxious weeds may increase due to the removal of trees and or shrub cover that creates open micro site (and sometimes macro site) habitats of reduced shade and soil cover, making conditions for noxious weed establishment favorable. Since noxious weed species tend to invade disturbed sites, the flag and avoid mitigations, the Resource Protection Measures and noxious weed mitigations would minimize the potential for the invasion of noxious weeds into sensitive plant occurrences.

Sensitive plants that may be indirectly affected by the spread of noxious weeds within the Proposed Alternatives 1 and 3 are *Botrychium ascendens*, *B. crenulatum*, *B. lunaria*, *B. minganense*, *B. montanum*, *Bruchia bolanderi*, *Cudonia monticola*, *Helodium blandowii*, *Meesia triquetra* and *M. uliginosa*. It is expected that bull thistle would be likely to invade these sensitive plant sites with or without disturbance. However, the protection of riparian habitat from direct ground disturbing impacts such as skid trails, landings and burn piles by flag and avoid mitigations would reduce the risk that musk thistle, bull thistle or woolly mullein would become dominant within the riparian habitat. The Noxious Weed Risk Assessment completed for this project determined an overall moderate risk of potential weed spread with the implementation of the Proposed Action. The standard practice of equipment cleaning before it arrives on site and avoiding or treating noxious weed infestations within the project area, would reduce the potential effects. It would be recommended that a noxious weed symbol should be placed on the timber Sale Admin Map at potential landing sites within Phoenix that were known to be infested with musk thistle so that they would not be used again for any project including this one to avoid spreading musk thistle.

### **Prevention Mitigations for Non- Native Invasive Plants of Concern**

This measure will be consistent with the current contract clause provision regarding equipment cleaning.

Include known locations of invasive species of concern on Timber Sale Administration maps so that units with noxious weed sites in close proximity can be avoided, to prevent contamination of equipment and adjacent areas.

Any materials for erosion control including gravel or straw bales should be weed free certified (although it is not proposed to bring in any materials at this time).

1. Prevention/Cleaning: Require all off-road equipment and vehicles (Forest Service and contracted) used for project implementation to be weed-free. The location of equipment's most recent operation shall be disclosed and off-road equipment should be cleaned prior to moving onto Sale Area when equipment is known to be from a potentially infested area. Off-road equipment shall be cleaned prior to moving from a unit shown to be infested with noxious weeds on Sale Area Map. Cleaning is not required for vehicles that will stay on the roadway.
2. Prevention/Road Construction, Reconstruction, and Maintenance: All earth-moving equipment, gravel, fill, or other materials need to be weed free. Use onsite sand, gravel, rock, or organic matter where possible.
3. Prevention/Revegetation: Use weed-free equipment, mulches, and seed sources. Avoid seeding in areas where revegetation will occur naturally, unless noxious weeds are a concern. Save topsoil from disturbance and put it back to use in onsite revegetation, unless contaminated with noxious weeds.
4. Prevention/Staging Areas: Do not stage equipment, materials, or crews in noxious weed infested areas where there is a risk of spread to areas of low infestation.
5. Small infestations identified during project implementation will be evaluated and hand treated

or “flagged and avoided” according to the species present and project constraints. If larger infestations are identified after implementation, they should be isolated and avoided with equipment (and equipment washed as in # 1 above).

6. Monitoring: Monitor for noxious weed invasion after timber sale implementation and after piles are burned. See SMR #26

By implementing these standard management requirements, the potential effects of noxious weed invasion can be minimized by reducing the potential for noxious weeds to be introduced into the ecosystem. However, areas that would become heavily impacted, such as landings and skid trails may become infested with those “C” rated weeds that are already ubiquitous to the area. Minimizing the invasion potential for noxious weeds would help to reduce the chances that these nonnative invasive plants would spread into sensitive plant habitat and affect those sensitive plant species.

### **Risk of Wildfire**

Indirect effects of Sagehen Project would be associated with the potential for equipment to start a fire or the increased level of fuels on the ground due to the logging activity. This project is designed to reduce the risk for wildfire over the long-term by treating those units proposed for treatment within Sagehen Basin under one of the action Alternatives (1 or 3). According to the Fuels Report, Alternative 1 best meets fire and fuels goals by modifying landscape scale wildland fire behavior with the reduction of fuels as shown in the Farsite discussion and FlamMap discussion (Ferguson, 2012). Alternative 1 decreases Rate of Spread (ROS), flame length and fire type by reducing the fuel load on the landscape. Alternative 1 creates heterogeneous forest stands that would be expected to develop with active fire conditions under an active fire regime (ibid). Further, Alternative 1 increases firefighter and public safety by providing firefighters with a safer place to engage in fire suppression and provides public with safer egress if a fire is to start within or around the Sagehen Basin. It further increases safety by developing safe evacuation routes (ibid). The historic role of fire is reintroduced for the first time in over 100 years with prescribed fire in many areas; key to the restoration of the ecosystem processes (General Technical Report PSW-GTR-220). The combination of treatments this alternative calls for enhances the longevity of the desired condition well past any of the other proposed alternatives (Ferguson, 2012). Therefore, the Proposed Action best achieves the flame lengths, fire types and fire rates of spread over the entire Project Area that would have occurred if there were active fire conditions under an active fire regime (ibid).

The fuel report also states that Alternative 3 reduces hazardous fuel loading in some areas within the Sagehen Basin but would only modify landscape scale wildland fire behavior in a portion of the Basin depending on where a fire starts (Ferguson, 2012). Since we do not know where fire will start in the future this alternative only partially meets fire and fuels goals (ibid). Under Alternative 3, wildland fire behavior would only be modified south of the Sagehen Field Station and treated areas around the Sagehen Field Station where the fuel reduction treatments would occur (ibid). Fuel loading in areas around the treatment units would continue to grow within the Sagehen Project Area, thus wildland fire behavior would also increase (ibid).

As a result both ladder and surface fuels would decrease over time, leading to a decreased risk of a widespread high intensity wildfire. *Botrychium* spp. depend on mycorrhizal symbiotic

relationships and can be found in variety of timber types to open meadows (Laeger, 2002). Wildfire would be less likely to affect those stands that may harbor these sensitive plant species because the implementation of the proposed project would ultimately reduce stocking levels and break up the continuity of fuels within those stands proposed for treatment. Higher tree densities within the 25 foot buffer around the fens would allow fuels to remain higher within the fen buffer. Higher fuels may increase the likelihood of fire burning at high intensity. It is hoped that the surrounding conditions with lighter fuels after the timber harvest activities have been completed would be an effective fuel break to reduce the chance that the buffers would catch fire and impact fen habitats where *Meesia triquetra*, *Meesia uliginosa* and at times *Botrychium* spp. can be found. Conifers may encroach into these systems over time, and are often contributing to the sustainability of these systems by contributing to the carbon balance needed to develop peat. None of the other sensitive plant species have been known to show a downward trend in the absence of tree removal. The other sensitive species such as *Boechera rigidissima* var. *demota*, *Erigeron miser*, *Eriogonum umbellatum* var. *torreyanum*, *Ivesia* spp., *Pyrrocoma lucida* and *Tauschia howellii* typically grow in openings in very specialized habitat that is less prone to the effects of wildfire since the habitat is rocky and naturally has very light fuel loading.

## **Cumulative Effects**

### **Geographical Context and Timelines**

No direct or indirect effects or cumulative effects are expected for *Boechera rigidissima* var. *demota*, *Astragalus webberi*, *Epilobium howellii*, *Erigeron miser*, *Eriogonum umbellatum* var. *torreyanum*, *Fissidens aphelotaxifolius*, *Hydrothyria venosa*, *Ivesia aperta* var. *aperta*, *I. aperta* var. *canina*, *I. sericoleuca*, *I. webberi*, *Lewisia kelloggii* spp. *hutchisonii*, *Lewisia kelloggii* spp. *kelloggii*, *Lewisia longipetala*, *Pyrrocoma lucida* and *Tauschia howellii* because either habitat is lacking or none was found to occur within the Sagehen Basin. Therefore, cumulative effects are not a concern for these species when considering activities associated with the Sagehen Project.

The eastside of the Tahoe National Forest was chosen as the cumulative effects analysis area for those species that are known to occur or could be present but are hard to find within the Sagehen Project Analysis Area and expected to experience slight direct and indirect impacts, i.e. *Botrychium ascendens*, *B. crenulatum*, *B. lunaria*, *B. minganense*, *B. montanum*, *Bruchia bolanderi*, *Cudonia monticola*, *Helodium blandowii*, *Meesia triquetra* and *M. uliginosa*.

The geographical boundaries for cumulative effects to these wide-ranging species such as *Botrychium ascendens*, *B. crenulatum*, *B. lunaria*, *B. minganense*, *B. montanum*, *Bruchia bolanderi*, *Cudonia monticola*, *Helodium blandowii*, *Meesia triquetra* and *M. uliginosa* have been limited to eastside Tahoe National Forest because these species are rare but widely ranging within California or around the world. The geographical boundary for consideration has been chosen to be large enough to provide a relative context and encompass potential habitat for these wide-ranging rare species within an area where management actions are known. Only general assumptions about habitat needs are analyzed in regard to these species, since not enough is understood about the specific habitat requirements for a detailed discussion of project level effects. These species have been designated as Forest Service Sensitive in Region 5 because known occurrences are typically very small in area or number of plants when they occur is very limited and/or the plants only occur in specialized riparian habitat.

Cumulative effects for *Botrychium ascendens*, *B. crenulatum*, *B. lunaria*, *B. minganense*, *B. montanum*, *Bruchia bolanderi*, *Helodium blandowii*, *Meesia triquetra* and *M. uliginosa*, have



been analyzed since some potential habitat that exists within the project has been proposed treatments. Records have been kept on known plant occurrences since these plants were added to the Regional Sensitive Plant List in 1998 and 2006. Cumulative effects to all of these riparian sensitive plant species are ongoing where they occur either by natural processes or by them being affected by multiple projects that enter the riparian zone. Fens are hydro biotic systems and any cumulative effects would have to consider the complicated and little understood interactions among wetland hydrology, water chemistry and biota (Siegel, D. I. 1988). The fens with special plant communities made up of many mosses including *Meesia triquetra* and *M. uliginosa* which occur in the fens in units 46, and 98 are known to have lower pH than those fens that are vegetated by the more common *Carex* species (sedge communities) that typically have a higher pH. Fens are also occurring within close proximity to units 61 and 163 but are buffered with 150 foot buffers between the unit and fens. Fen plant communities are very sensitive to changes in pH and concentrations of calcium and other nutrients. Chemical interactions caused by mixing small amounts of groundwater with large amounts of organic- rich surface water in the mixing zone can raise the pH from 4.0 to 6.0 units that is well above the tolerance of the preferred fen plants (Siegel, D. I. 1988). It is hard to evaluate the potential cumulative impacts on wetland hydrology because geologic settings of wetlands are often complex and the methods used to measure wetland stream flow, ground water flow and evapotranspiration are inexact (Winter 1988).

Maintaining a no treatment buffer would help to maintain the shoreline anchoring and dissipation of erosive forces around to edges, but the degree by which this technique would help to moderate a change in pH is unknown. No definitive studies are available maintain a no treatment buffer would help.

See Table 3 below which summarizes the projects that have been considered to gauge the relative intensity of impacts for the Tahoe National Forest sensitive plant species that have been recognized as being affected directly and/or indirectly within the Sagehen Project. By far, the most frequently occurring disturbances result from the range grazing allotment activities because they are reoccurring every year and livestock have not been excluded from accessing fens. It is important to note that the Sagehen Allotment was removed from the Tahoe National Forest Allotment grazing permanently in 2006, so that livestock grazing in Sagehen Basin is no longer a contributing factor to the cumulative effects. Other projects have included mitigations that limit the direct and indirect impacts to reduce the likelihood that activities associated other vegetation management projects avoid directly impacting these sensitive species. Mitigations also reduce the likelihood for indirect impacts, so the potential for cumulative impacts are low to moderate. These species are widely occurring within the world, but where they occur their numbers are typically small or the area they cover adds up to be rather small.

### **Past and Ongoing Cumulative Effects**

Management activities have occurred on the eastside of the TNF system and privately owned lands for over a century. Historic management activities on TNF system lands include: gold mining, gravel mining, hydroelectric development, land clearance, diversions of water for irrigation, land drainage, timber harvest, construction of roads and railroads, urbanization, livestock grazing, ground water abstraction, and others (Kondolf et al. 1996). This long history of disturbance to aquatic/riparian plant communities has contributed to the lack of an undisturbed reference for most aquatic/riparian dependent sensitive species. Therefore, it is not possible to

quantify how these past management activities have impacted them. Historically, springs, creeks, and rivers were altered by diversion of water; meadows and fens were converted to other types of habitats due to human activity that dried them out; aquatic/riparian areas were repeatedly and heavily grazed by domestic livestock; and numerous roads were built in areas that changed the hydrology of those habitats. These activities and others have cumulatively reduced the amount of aquatic/riparian plant communities within TNF watersheds that would be suitable habitat for: *Botrychium ascendens*, *B. crenulatum*, *B. lunaria*, *B. minganense*, *B. montanum*, *Bruchia bolanderi*, *Epilobium howellii*, *Fissidens aphelotaxifolius*, *Helodium blandowii*, *Hydrothyria venosa*, *Meesia triquetra*, and *M. uliginosa*. The amount of habitat reduction is unknown.

**BE Table 3- Relative potential for sensitive plant species to experience cumulative effects from multiple projects on the eastside of the Tahoe NF and the Sagehen Project.**

Tahoe sensitive plant species	Potential to occur in Sagehen Basin	Found to occur in other project areas on Eastside	Potential for cumulative impacts
<i>Botrychium ascendens</i>	Two occurrences found in the Sagehen Basin near units 61 and 163. High amount of potential habitat within fens (53ac.)	Billy Hill	Moderate
<i>B. crenulatum</i>	Five occurrence found in Sagehen Basin. High amount of potential habitat within fens (53ac.)	Transition	Moderate
<i>B. lunaria</i>	High amount of potential habitat within fens (53ac.)	None	Low
<i>B. minganense</i>	High amount of potential habitat within fens (53ac.)	None	Low
<i>B. montanum</i>	High amount of potential habitat within fens (53ac.)	None	Low
<i>Bruchia bolanderi</i>	High amount of potential habitat within buffers	Travel Management	Low

Tahoe sensitive plant species	Potential to occur in Sagehen Basin	Found to occur in other project areas on Eastside	Potential for cumulative impacts
	surrounding special aquatic features (229.5 ac.)		
<i>Helodium blandowii</i>	High amount of potential habitat within buffers surrounding special aquatic features (229.5 ac.)	None	Low
<i>Meesia triquetra</i>	13 of the known 26 occurrences on the Tahoe NF fall within the Basin. High amount of potential habitat within fens (53ac.)	Outback, Transition, Dingo, Leftover Underburn, Independence Allotment,	High
<i>M. uliginosa</i>	14 of the known 31 occurrences on the Tahoe NF fall within the Basin. High amount of potential habitat within fens (53ac.)	Outback, Transition, Jumbuck, Leftover Underburn, Independence Allotment, Smithneck Allotment	High
Fens	53 ac. habitat for five species of <i>Botrychium</i> and four species of mosses. (Listed above)	Billabong, Kangaroo, Outback, Transition, Jumbuck, Leftover Underburn, Independence Allotment, Smithneck Allotment	High

In addition, past management has created conditions on the landscape that frequently contribute to cross country travel. For example, skid trails that were created during a fuel reduction/timber harvest project are generally blocked off where they connect to NFTS motorized roads and trails once the project has been implemented. Continued use of the old skid trails creates a motorized trail that has not been designed for the use, and may be located in an area that is not best suited to

that use. Trail planning and design – especially location – are important considerations for limiting disturbances to natural resources (Foltz and Meadows 2007) such as sensitive species.

The Rice and Onion Creek areas are included in an inactive portion of the active Kyburz Allotment. Sheep grazing has been ongoing for many years primarily in the active portion of the Kyburz Allotment. The planning for the Kyburz Allotment was completed in 2008 and the portion of the allotment west of Highway 89 was designated as inactive until further notice. The fens in inactive allotments or found in areas outside the scheduled grazing allotments have more frequently been known to support *Meesia triquetra* and *M. uliginosa* which are fen-dependent mosses and sensitive plants on the Tahoe list. Sagehen Basin has the highest concentration of fens that are in relatively good condition since they have received very little grazing over the past ten years. The fens in Sagehen would not be impacted by livestock grazing unless animals manage to stray from other grazing allotments.

The Perazzo Allotment has been supporting cattle use for many years and many of the fens in that area were surveyed. In general, the fens in the Perazzo Allotment were found to be in poor condition and currently do not support any sensitive plant species occurrences.

There are several ongoing vegetation management projects in adjacent areas that have been planned, partially implemented or not implemented to the north of Sagehen Basin on the Sierraville Ranger District. These include Leftover Underburn, Topaz, Outback, Kangaroo, Billabong, Dinkum, Dingo and Phoenix vegetation management projects. Since many of these projects include management in RCAs, direct impacts were excluded from known fens and sensitive plants sites by flag and avoid mitigations. Indirect or cumulative effects to known occurrences of the riparian dependent sensitive plant species are expected to be mitigated by flag and avoid mitigations as well. There are several ongoing range grazing permits that do repeatedly impact riparian vegetation including the special aquatic features on at least a yearly basis. The range allotment grazing permit areas that include fens with and without known sensitive plant occurrences on the Truckee and Sierraville Ranger Districts are: Bear Valley, Beckwourth, Boca, Bickford, English, Independence, Perazzo Meadows, Payen, Smithneck, Kyburz and Pass Creek, Lincoln Valley and Haypress Allotments.

On the Truckee Ranger District, the Boca, Kyburz, Sagehen, Sierra Crest and Summit (BKS) Range NEPA was recently approved and includes many guidelines and closures to reduce potential impacts to *Botrychium ascendens*, *B. crenulatum*, *B. lunaria*, *B. minganense*, *B. montanum*, *Bruchia bolanderi*, *Fissidens aphelotaxifolius*, *Helodium blandowii*, *Hydrothyria venosa*, *Meesia triquetra* and *M. uliginosa* or their habitat. Designated avoidance areas to range grazing activities within the Boca Allotment have been established in the Donner Camp area, Bull pen and the Sagehen Arm Meadow where potential habitat exists for meadow dependent species. It was determined that the implementation of these restricted areas, guidelines, and effectiveness monitoring, livestock use in the area would be able to continue without causing a trend toward federal listing or a loss of viability to the TNF sensitive plant species. The BKS Allotment Update included the removal of Sagehen, Sierra Crest and Summit Allotments from the Tahoe National Forest Grazing Program. The permanent closure of these allotments to grazing will protect all of the TNF sensitive plant occurrences in Sagehen basin and the high elevations from the Miller Creek and Barker Pass area, north to Donner Summit and Castle Peak area from the impacts of frequent livestock grazing. Several occurrences of *Botrychium ascendens*, *B. crenulatum*, *Meesia triquetra* and *Meesia uliginosa* are known to occur in Sagehen watershed.

Aspen restoration projects that have removed the majority of conifer trees and disturbed riparian habitat and riparian dependent sensitive plant species on the Sierraville Ranger District are Billabong, Outback and Kangaroo. As explained above, since potential habitat for *Botrychium ascendens*, *B. crenulatum*, *B. lunaria*, *B. manganense*, *B. montanum*, *Bruchia bolanderi*, *Helodium blandowii*, *Epilobium howellii*, *Meesia triquetra* and *M. uliginosa* exists within these project areas, there is potential for these species to be affected inadvertently. See Table 3 that shows the relative likelihood that these sensitive plant species would be affected. Those species that have not been found to occur on the eastside of the Tahoe but could eventually be found, have a low likelihood of being affected. Those species known to occur at a few locations but not within Sagehen and several other project areas would have a moderate potential to be repeatedly affected. Those species such as *Meesia triquetra* and *M. uliginosa* that occur in association with specialized riparian vegetation that is being affected by several projects is given a high potential to be affected repeatedly. As long as the fens that provide such habitat remain intact the sensitive plants would survive the disturbances in adjacent areas. Flag and avoid mitigations have been used to protect fens from direct impacts. These mitigations are generally effective with the exception of range grazing permits. See Appendix B.

### **Cumulative Effects in the Foreseeable Future**

The Transition, Saddle and Nevada Energy 619 projects on the Sierraville Ranger District are in the planning stage or appeal process and are expected to minimize impacts to known and potentially occurring riparian species including *Botrychium ascendens*, *B. crenulatum*, *Meesia triquetra* and *M. uliginosa* by applying the Best Management Practices, including flag and avoid mitigations that protect the best quality of potential habitat for the riparian dependent species. The Independence Allotment will be updated within the next few years. It is expected that all of these projects would include mitigations to reduce the potential for impacts and monitor for concerns to help manage impacts to TNF sensitive plant species habitat and occurrences.

Although there are ongoing cumulative impacts to the known sensitive plant occurrences on the Tahoe NF, only a few of these occurrences were found to occur within the units within the Sagehen Project Area. Mitigations to protect the longevity of the fens and the habitat for the known sensitive species were added to the project. The Sagehen Basin remains the refuge for such species on the east side of the Tahoe NF because the most frequent recurring damage to fens across the forest is related to livestock grazing which has been discontinued in the Sagehen Basin. The Sagehen Project remains a very small contributing factor to the potential cumulative effects to these species.

### **B. Alternative 2- No Action: Direct Effects**

There would be no direct effects related to the Sagehen Project, No Action Alternative to *Boechera rigidissima* var. *demota*, *Astragalus webberi*, *Botrychium ascendens*, *B. crenulatum*, *B. lunaria*, *B. manganense*, *B. montanum*, *Bruchia bolanderi*, *Cudonia monticola*, *Epilobium howellii*, *Erigeron miser*, *Eriogonum umbellatum* var. *torreyanum*, *Fissidens aphelotaxifolius*, *Helodium blandowii*, *Hydrothyrta venosa*, *Ivesia aperta* var. *aperta*, *I. aperta* var. *canina*, *I. sericoleuca*, *I. webberi*, *Lewisia kelloggii* spp. *hutchisonii*, *L. k. ssp. kelloggii*, *L. longipetala*, *Meesia triquetra*, *M. uliginosa*, *Pyrrocoma lucida* or *Tauschia howellii* from the No Action Alternative. All effects to these species are addressed under ongoing activities.

## Indirect Effects

The fuels report states that Alternative 2 does not reduce hazardous fuel loading therefore it does not modify landscape scale wildland fire behavior (Ferguson, 2012). If Alternative 2 is selected the threat of high severity fire would remain (ibid). It also does not create heterogeneous forest stand conditions; therefore it does not meet fire and fuels goals that are outlined earlier in the document (ibid). It is understood that fire severity potential and fuel characteristics in the area would increase in the future from current conditions (ibid). Surface and ladder fuels would continue to build, increasing the future probability of dangerous destructive fires (ibid). Alternative 2 would increase the susceptibility of forest stands to disturbances such as fire, insect, and disease outbreaks over time as fuel loadings continue to increase due to conifer mortality and increasing stand densities (ibid). It is known that fire control tactics could be far more costly and less effective if the proposed activities were foregone and the disturbance processes such as fire or insect and disease outbreaks occurred (ibid). Costs of wildfire suppression and emergency rehabilitation may continue to rise as they have in the past (ibid).

Indirect effects of the no action would be those associated with increasing potential for surface fuels to continue to increase over time, leading to an increase in the risk of a high intensity wildfire. Wildfires could affect any one of the sensitive species with known occurrences on the eastside of the Truckee and Sierraville Ranger District. For example, *Botrychium* spp. could be affected since *Botrychium* spp. depend on mycorrhizal symbiotic relationships and can be found in variety of timber types to open meadows (Laeger, 2002). This is true also for the fen habitats where *Meesia triquetra*, *Meesia triquetra* and at times *Botrychium* spp. can be found since trees, which may encroach into these systems over time are common, and many times are required to sustain these systems by contributing to the carbon balance. None of the other sensitive plant species have been known to show a downward trend in the absence of tree removal. The other sensitive species such as *Ivesia sericoleuca* typically grows in openings in very specialized habitat that is less prone to the effects of wildfire since the habitat is rocky with a very light fuel loading.

Many times the effects of fire suppression can have larger effects to sensitive plants and their habitat than the wildfire itself, but actual effects to sensitive species depends on fire timing and intensity. Although *Botrychium* spp. appear able to survive a low to moderate intensity fire that does not kill mycorrhizal soil fungi (Johnson-Groh, 1995), a high intensity fire could heat the soil enough to kill *Botrychium* plants and/or mycorrhizal fungi (Johnson-Groh and Farrar, 1996). Due to the loss of stabilizing vegetation and duff, hydrological changes and increased erosion could also follow a high intensity fire. Such changes could destroy *Botrychium* spp. habitat, as well as habitat for *Epilobium howellii*, occurrences have been shown to be negatively impacted by fires, especially when the duff layer and canopy are removed (USDA FS, 2005d). While not much is known about fire effects on *Hydrothyria venosa*, it is known to grow in clear cold running streams and may not survive the period after the fire with sedimentation and high runoff. Due to this species preference for partially shaded conditions, it can be assumed that a stand replacing fire would have the potential to negatively impact this species and its potential habitat. *Meesia triquetra* and *M. uliginosa* plants and habitat are not likely to be affected by a high intensity fire because they occur in open, saturated fen habitats that would not burn.

The current and future threats of noxious weed infestations would dramatically increase in the event of a wildfire. The Noxious Weed Risk Assessment for the Sagehen Project (Appendix) determined that there was a low current habitat vulnerability and low to moderate non-project dependent vectors associated with the project area, in the absence of the Proposed Action.

### **Cumulative Effects**

The eastside of the Tahoe National Forest was chosen as the cumulative effects analysis area for the riparian dependent sensitive species for the No Action Alternative as explained above. Cumulative effects for past, ongoing and foreseeable future actions for the No Action Alternative could be greater than those previously discussed within Alternatives 1 and 3. The possibility for wildfire in the area would be higher as stated above because the proposed units would not be treated and no excess fuels would be removed from the landscape. There exists about 53 acres of fen area within Sagehen Basin that provides potential habitat that could be impacted by wildfire within the Sagehen Basin where *Botrychium ascendens*, *B. crenulatum*, *B. lunaria*, *B. minganense*, *B. montanum*, *Bruchia bolanderi*, *Cudonia monticola*, *Helodium blandowii*, *Meesia triquetra*, *M. uliginosa* are assumed present or known to occur if the No Action Alternative is chosen. The potential for impacts would be greater under the No Action Alternative since the risk for wildfire would be higher and could affect more area. The impacts to these species would still be expected high because of the high intensity and fire suppression activities that would come along with the fire even though most of the sensitive plant occurrences in the area occur in perennially wet habitats except *Ivesia sericoleuca*.

## **IV. DETERMINATIONS**

### **Proposed Action Alternative – 1 and Hazardous Fuels Reduction Alternative 3**

"It is my determination that implementation of the Proposed Action Alternative 1 and the Hazardous Fuels Reduction Alternative 3 could adversely affect a few individuals of those species that are assumed to be present, *Botrychium lunaria*, *B. minganense*, *B. montanum*, *Bruchia bolanderi*, and *Helodium blandowii* plants, but proposed activities would not likely to cause a trend to federal listing or a loss of viability because about 80 percent potential habitat occurs away from proposed treatment units within the Sagehen Project area and Best Management Practices would be implemented that would minimize potential impacts. *Botrychium ascendens*, *B. crenulatum*, *Ivesia sericoleuca*, *Meesia triquetra* and *M. uliginosa* have the highest potential for impacts since they are known to be present in or near the units. It is my determination that the actions could impact a few *Botrychium ascendens*, *B. crenulatum*, *I. sericoleuca*, *Meesia triquetra* and *M. uliginosa* individuals, but proposed activities would not be likely to cause a trend to federal listing or a loss of viability because about 80 percent of habitat occurs outside proposed units and impacts to habitat would be minimized by the use of flag and avoid mitigations and Best Management Practices within the Sagehen Project area. The implementations of these mitigations would help protect the best potential habitat that exist in special aquatic features like fens, springs, seeps, stream banks and stream courses within the Riparian Conservation Areas where these plants could be present. It is my determination that there would not be any adverse effects to *Boechnera rigidissima* var. *demota*, *Astragalus webberi*, *Epilobium howellii*, *Erigeron miser*, *Eriogonum umbellatum* var. *torreyanum*, *Fissidens aphelotaxifolius*, *Hydrothyria venosa*, *Ivesia aperta* var. *aperta*, *I. aperta* var. *canina*, *I. webberi*, *Lewisia kelloggii* spp. *hutchisonii*, *L. k. spp. kelloggii*, *L. longipetala*, *Pyrrocoma lucida* and *Tauschia howellii* or their habitat because none of these plants or suitable habitat were found to

be present within close proximity to any units proposed in the Sagehen Project Area. *Cudonia monticola* is a fungus that is not eligible for the federal endangered species list, so a determination for this species is irrelevant. ”

## **No Action Alternative 2**

"It is my determination that implementation of the No Action Alternative 2 could indirectly cause effects to potential habitat for *Botrychium ascendens*, *B. crenulatum*, *B. lunaria*, *B. minganense*, *B. montanum*, *Bruchia bolanderi*, *Helodium blandowii*, *Ivesia sericoleuca*, *Meesia triquetra*, *M. uliginosa* plants, but would not contribute to a trend for listing. The “No Action” would result in a much higher risk for wildfire. The No Action Alternative would not be likely to cause a trend for listing for these sensitive plant species because they primarily occur within fens that are known to be perennially wet even during dry years. The sensitive plant habitat in fens are less vulnerable to the effects of wildfire than others that occur on dry land. However, the lack of action would allow the potential risk for wildfire to increase along the roads and wildfire could damage habitat if a very intensive, large fire develops and causes damage from suppression activities and results in an increase of the spread of noxious weeds. It is my determination that there would not be any adverse effects to *Boechera rigidissima* var. *demota*, *Erigeron miser*, *Eriogonum umbellatum* var. *torreyanum*, *Hydrothyria venosa*, *Ivesia aperta* var. *aperta*, *I. aperta* var. *canina*, *I. webberi*, *Pyrrocoma lucida* and *Tauschia howellii* or their habitat because none of these plants were found to be present within close proximity to any units proposed in the Sagehen Project Area and there is very little potential habitat in the Sagehen Basin. *Cudonia monticola* is a fungus that is not eligible for the federal endangered species list, so a determination for this species is irrelevant. ”

## **V. RECOMMENDATIONS RELATED TO SENSITIVE PLANTS FOR ALTERNATIVES 1 AND 3**

1. Apply Standards and Guidelines from the 1990 Tahoe National Forest Lands and Resource Management Plan (LRMP), as amended by the SNFPA FSEIS ROD (2004).
2. Place “Flag and Avoid” mitigations to prevent tractors from operating within 25 feet of the potential fens. These five known fen areas should be posted with “tractor keep out signs”. The fen areas are located in southwestern edge of 85 and three fens are present in the central portion of 46 within emphasis area 4 and in the central portion of unit 98.
3. A fire plan will be approved by the Forest Service to address fire prevention and suppression while the equipment is in use for all tree cutting or removal activities.
4. Implement all applicable Best Management Practices, flag and avoid around fens according to the Standard Management Requirements in all units that include fen habitat (46, 85, 98, 99, and place density cover patches around fens within unit 98).



## **Prevention Mitigations for Non- Native Invasive Plants of Concern**

This measure will be consistent with the current contract clause provision regarding equipment cleaning.

Include known locations of invasive species of concern on Timber Sale Administration maps so that units with noxious weed sites in close proximity can be avoided, to prevent contamination of equipment and adjacent areas.

Any materials for erosion control including gravel or straw bales should be weed free certified (although it is not proposed to bring in any materials at this time).

1. Prevention/Cleaning: Require all off-road equipment and vehicles (Forest Service and contracted) used for project implementation to be weed-free. The location of equipment's most recent operation shall be disclosed and off-road equipment should be cleaned prior to moving onto Sale Area when equipment is known to be from a potentially infested area. Off-road equipment shall be cleaned prior to moving from a unit shown to be infested with noxious weeds on Sale Area Map. Cleaning is not required for vehicles that will stay on the roadway.

2. Prevention/Road Construction, Reconstruction, and Maintenance: All earth-moving equipment, gravel, fill, or other materials need to be weed free. Use onsite sand, gravel, rock, or organic matter where possible.

3. Prevention/Revegetation: Use weed-free equipment, mulches, and seed sources. Avoid seeding in areas where revegetation will occur naturally, unless noxious weeds are a concern. Save topsoil from disturbance and put it back to use in onsite revegetation, unless contaminated with noxious weeds.

4. Prevention/Staging Areas: Do not stage equipment, materials, or crews in noxious weed infested areas where there is a risk of spread to areas of low infestation. Place the NW (noxious weed) symbol on the Timber Sale Administration Map near the entrance to the Bickford Ranch and within the Phoenix unit at north of Sagehen Summit in section 32.

5. Small infestations identified during project implementation will be evaluated and hand treated or "flagged and avoided" according to the species present and project constraints. If larger infestations are identified after implementation, they should be isolated and avoided with equipment (and equipment washed as in # 1 above).

6. Monitoring: Monitor for noxious weed invasion after timber sale implementation and after piles are burned. See SMR #26

## **X. APPENDICES (in Project File)**

### **APPENDICES to Plant BE**

**Appendix X:** Tahoe National Forest Sensitive Plant Species Habitat Descriptions

**Appendix Y:** Botanical References

## Appendix: X

### Tahoe National Forest Endangered, Threatened and Sensitive Plant Species Habitat Descriptions

**Introduction:** Information about each of the TNF sensitive plants and fungi is generated within Region 5 and the adjacent Toiyabe National Forest as part of routine information sharing among agencies, organizations, and individuals dedicated to conservation of rare plants and fungi. New information about each of the sensitive plants and fungi evaluated in this document is also shared routinely amongst forest botanists within the Forest Service. In addition, the TNF submits data regularly to the California Natural Diversity Database, California Department of Fish and Game (CDFG), and the California Native Plant Society (CNPS) to gather and compile information about rare plant species. The TNF rare plant program documents provide more information about what is known about each of the sensitive plants and fungi known or suspected to occur on the TNF (TNF files 2008).

**Appendix X - Table 4. Number of sensitive plant and fungi occurrences on the TNF by species**

Scientific Name	Known Occurrences on TNF system lands	Estimated number of plants
<i>Boechera rigidissima</i> var. <i>demota</i>	None	0
<i>Astragalus webberi</i>	None	0
<i>Botrychium ascendens</i>	4	Less than 80
<i>Botrychium crenulatum</i>	8	Less than 500
<i>Botrychium lunaria</i>	None	0
<i>Botrychium minganense</i>	None	0
<i>Botrychium montanum</i>	None	0
<i>Bruchia bolanderi</i>	4	Number of moss plants not estimated
<i>Calochortus clavatus</i> var. <i>avius</i>	None	None
<i>Calystegia stebbinsii</i>	1	10,000
<i>Clarkia biloba</i> ssp. <i>Brandegeae</i>	4	Varies by year – this is an annual plant – less than 4,000
<i>Cudonia monticola</i>	1	Not estimated – most of the fungus is underground.
<i>Cypripedium fasciculatum</i>	6	Less than 500
<i>Cypripedium montanum</i>	None	None
<i>Dendrocollybia racemosa</i>	1	Not estimated
<i>Epilobium howellii</i>	7	Less than 1,500
<i>Erigeron miser</i>	14	8,100 +
<i>Eriogonum umbellatum</i> var. <i>torreyanum</i>	11	7,000
<i>Fissidens aphelotaxifolius</i>	None	Number of moss plants not estimated
<i>Fritillaria eastwoodiae</i>	7	Less than 1,000
<i>Helodium blandowii</i>	None	Number of moss plants not estimated
<i>Hydrothyria venosa</i>	None	Number of lichen not estimated
<i>Ivesia aperta</i> var. <i>aperta</i>	5	Less than 5,000
<i>Ivesia aperta</i> var. <i>canina</i>	None	None
<i>Ivesia sericoleuca</i>	28	50,000
<i>Ivesia webberi</i>	None	None
<i>Lewisia cantelovii</i>	16	Less than 5,000

Scientific Name	Known Occurrences on TNF system lands	Estimated number of plants
<i>Lewisia kelloggii</i> ssp. <i>hutchisonii</i>	5	Less than 1,500
<i>Lewisia kelloggii</i> ssp. <i>kelloggii</i>	None	None
<i>Lewisia longipetala</i>	4	Less than 1,000
<i>Lewisia serrata</i>	5	Less than 500
<i>Lupinus dalesiae</i>	2	Less than 500
<i>Meesia triquetra</i>	20	Number of moss plants not estimated.
<i>Meesia uliginosa</i>	25	Number of moss plants not estimated.
<i>Mielichhoferia elongata</i>	None	Number of moss plants not estimated
<i>Monardella follettii</i>	None	None
<i>Packera layneae</i>	1	100
<i>Penstemon personatus</i>	2	Less than 1,000
<i>Phacelia stebbinsii</i>	19	Varies by year – this is an annual plant
<i>Phaeocollybia olivacea</i>	2	Not estimated – most of the fungus is underground.
<i>Pyrrocoma lucida</i>	12	Less than 25,000
<i>Tauschia howellii</i>	2	Less than 5,000

### Existing Condition Summaries by Species

The following section provides information about all Tahoe NF sensitive species.

### Federally Listed Species on the Tahoe National Forest

**Stebbins' Morning Glory (*Calystegia stebbinsii*):** This USFWS-listed, endangered plant is found in serpentine or gabbroic soils derived from ultra-mafic parent material (USFWS 2002a). On the Tahoe National Forest, this species may be found on the following soil mapping units: DUE and DUF (Dubakella-Dubakella variant-rock outcrop complexes); ISE, ISE5, and ISF (Forbes-Dubakella complexes); and RDE and RDG (rock outcrop- Dubakella-Dubakella variant complexes). Dubakella soils have thin surface layers, are moderately deep, have a high amount of rock fragments, and have low subsoil strength when wet. These soils reach field capacity rapidly and can produce surface runoff. Concentrated surface runoff from rock outcrop areas can increase erosion on adjacent soils. Forbes-Dubakella soils are similar to Dubakella soils with loamy textures: rock outcrop-Dubakella soils are also similar to Dubakella soils and have a thick, dark surface layer (USFS 1994). Stebbins' morning glory is known from four occurrences in the Sierra Nevada Mountain foothills: two in Eldorado County (near Shingle Springs and Salmon Falls in the northern and southern portions of the Pine Hill geologic formation) and two in Placer County (one near Grass Valley and a recently discovered occurrence near Foresthill, California) (Jepson 2010a and USFWS 2002a). The Sage Hill population covers approximately 80 acres on gabbroic soils (DUE, DUF, ISE, and ISE5 soil types) at approximately 3,600 feet elevation and includes about 10,000 plants in widely scattered clumps (Van Zuuk personal comm. 2010). The American River Ranger District is located outside preserve system identified by the USFWS for this species in the Recovery Plan for Gabbro Soil Plants of the Central Sierra Nevada Foothills (USFWS 2002a). Critical habitat has not been designated for this species.

Habitat requirements for this species and effects of vegetation management practices to its habitat are not fully known. This early seral species occurs in openings within chaparral on gabbroic and serpentine soils, does not occur beneath a closed canopy of vegetation, and seems to be shade intolerant (USFWS 2002a). Above ground portions of plants may persist for several years, while underground portions may survive much longer (L. Eng. *In lit.* 1999 *In* USFWS 2002a). A seed bank is established before the plant disappears (Nosal 1997 *In* USFWS 2002a). Based on the associated plant community and management history of the local population of this species near Sage Hill, Stebbins' morning glory appears adapted to a slight to moderate degree of disturbance (i.e. low to moderate severity fire or other processes that result in early seral vegetation).

Layne's Butterweed (*Packera layneae*): This USFWS-listed, threatened plant is found in serpentine or gabbro soils derived from ultra-mafic parent material (USFWS 2002a). *Packera layneae* (formerly *Senecio layneae*) may be found on the same soil mapping unit types as described above for *Calystegia stebbinsii* (i.e. DUE, DUF, ISE, ISE5, ISF, RDE and RDG). Layne's butterweed is known from several localities within the foothills of El Dorado, Tuolumne, and Yuba Counties (Jepson 2010b and USFWS 2002a) and was recently discovered in Placer County near Foresthill, CA. The latter occurrence in Placer County is located just west of Sage Hill. The occurrence of Layne's butterweed near Sage Hill is located within a recently discovered occurrence *Calystegia stebbinsii*, covers approximately 12 acres on gabbro soil (DUE soil type only) at approximately 3,600 feet elevation, and includes about 100 plants in widely scattered clumps (Van Zuuk personal comm. 2010). The American River Ranger District of The Tahoe NF is located outside preserve system identified by the USFWS for this species in the Recovery Plan for Gabbro Soil Plants of the Central Sierra Nevada Foothills (USFWS 2002a). Critical habitat has not been designated for this species.

Habitat requirements for this species and effects of vegetation management practices to its habitat are not fully known. This early seral species occurs in temporary openings in chaparral plant communities on gabbro and serpentine soils and "is eliminated as vegetation grows up around it" (USFWS 2002a). Like *Calystegia stebbinsii* and based on the associated plant community and management history of the local population of this species near Sage Hill, Layne's butterweed appears adapted to a slight to moderate degree of disturbance (i.e. processes such as wildland fire that result in early seral vegetation).

### **Tahoe National Forest Sensitive Plant Species**

***Astragalus webberi* (Webber's milk-vetch):** Webber's milk-vetch is a geographically restricted legume species that is known to occur in Plumas County. It has not been found in the TNF even though it was historically recorded as occurring in Sierra County in the Sierra Valley area. The Sierra Valley occurrence has not been relocated since it was first recorded by Lemmon and associates. It is possible that the historic collections by Lemmon and associates were collected in the Indian Valley area and not the Sierra Valley area (Barneby 1964, Ikeda and Witzman 1989). The Plumas NF (PNF) reports that this species is not habitat specific. It grows in the general openings guild. It is one of the few members of the genus that is native to the west slope of the northern Sierra Nevada. Most of the known occurrences are along highways on cutbanks or just within the forest edge. Webber's milk-vetch is declining in trend. Threats from management

activities include road maintenance and construction, trash dumping, vehicle parking, reforestation, livestock grazing and trampling, and timber harvest. There are no occurrences of this plant known to occur on the TNF.

***Boechea rigidissima* var. *demota* (Carson Range rock cress):** Most of the known occurrences of this plant are located within the state of Nevada on the Carson Range. Most occurrences are found on private lands and are not protected. There are only two occurrences known in California with no known occurrences on TNF system lands. The California occurrences are located near Martis Peak in Placer and Nevada Counties. Carson Range rock cress is considered a geographically restricted regional endemic that is only found from the Carson Range of the Sierra Nevada. It is known to grow in sandy and rocky soils or outcrops derived from granitic or volcanic materials mostly on moderate to steep northerly aspects, often in drainages/meadow edges/dry openings. The elevational range of known occurrences is between 7,500 and 8,500 feet. These habitats are generally considered subalpine habitats. Subalpine habitats are limited in distribution and are fragile, i.e. they have a short growing season and not much resilience to disturbance. The trend for Carson Range rock cress is unknown. Threats to this plant from management activities include development (urban/ski area/facilities); timber harvest; roads; recreation trail construction, maintenance, and use; off-road vehicle use; livestock grazing, fire-fighting/suppression activities; prescribed burning; and any activities that degrade air quality, cause erosion, or aid in illegal plant collection.

***Botrychium ascendens* (Triangle-lobe moonwort):** This moonwort is known to occur in Canada, Alaska, Nevada, California, and the Pacific Northwest. In California, it is known from Butte, El Dorado, Mono, Placer, Plumas, Nevada, Shasta and Tehama Counties. TNF occurrences are located in the Sagehen Creek area and in Duncan Peak Roadless area (Laeger 2002).

***Botrychium crenulatum* (Scalloped moonwort):** This moonwort has the widest distribution of all the moonworts in California, but is not common anywhere. It is limited to the western United States, scattered from California to Montana. In California, it is known to occur in Butte, Colusa, Los Angeles, Nevada, Modoc, Mono, Placer, Plumas, Tehama, Tulare, San Bernardino, Shasta and Sierra Counties. This moonwort species occurs on the TNF.

***Botrychium lunaria* (Common moonwort):** This moonwort is known to occur from Alaska to California, and in Arizona and the Great Lakes region. In California, it is known from Modoc, Mono, and Nevada Counties. It grows with many other species of *Botrychium* and occasionally hybridizes with them ([www.eFloras.org](http://www.eFloras.org), February 2006).

***Botrychium minganense* (Mingan moonwort):** This moonwort is known to occur from Alaska throughout boreal Canada, southward into all of the western mountain states to Arizona, and eastward along the northern states to the Atlantic Canadian Provinces and New England. In California, it is known from Butte, Fresno, Modoc, Nevada, Plumas, Shasta and Tehama Counties.

***Botrychium montanum* (Mountain moonwort):** This moonwort is known to occur from British Columbia, California, Montana, Oregon, and Washington. In California, it is known from Butte, Modoc, Nevada, Plumas, Shasta and Tehama Counties.

***Botrychium* species:** These *Botrychium* species plants are found under riparian shrubs/vegetation or near it. Trend is unknown and hard to determine because sporophytes do not appear above

ground each year. Occurrences of these *Botrychium* species are small and the numbers of plants known to occur in California is low. Moderate to heavy soil disturbance is detrimental. A small amount of disturbance may be tolerated; but heavy disturbance will kill individuals. Threats include grazing and trampling by livestock and vehicle activity. Changes in hydrologic regime (from erosion, roads, grazing, etc.) are also considered threats. Hot fires have been shown to be detrimental, especially if the soil conditions are very dry during the burn. All occurrences within the state and on the TNF are small and the number of plants per occurrence is low.

***Bruchia bolanderi* (Bolander's candle moss):** This moss is endemic to California and Oregon (Christy and Wagner 1996). California populations are known from Fresno, Tehama, Madera, Mariposa, Nevada, Tuolumne, Tehama and Plumas counties (UC Berkeley Herbarium specimens, CNPS 2001). The California Native Plant Society (CNPS) considers this moss fairly endangered in California and rare outside of California (CNPS 2001). *Bruchia bolanderi* is reported to grow on moist soil, often along exposed edges of streams through meadows or in exposed and disturbed soils or under grasses; sometimes partially shaded by coniferous forests. On the TNF it has only been found on cutbanks of a road and streams. It grows from about 4,000 to above 9,000 feet. The species is opportunistic, taking advantage of disturbed sites and minimal competition from other vegetation (Christy and Wagner 1996). However, sporophytes are infrequently encountered in many California populations. The ephemeral nature of this species and its occurrence in disturbed sites allow some flexibility in management (ibid). The species is difficult to identify without a sporophyte, which may make surveys for this species problematic. This plant has been found on the TNF, in the Castle Valley, Round Valley, and upper Lola Montez areas. Trend is not determined. No population monitoring has occurred. Potential threats include direct impacts from management activities that directly damage the plants. Most of the proposed motorized trails go through unsurveyed potential habitat for this moss. The perennial crossing of proposed road TKN-J5 impacts the *Bruchia bolanderi* occurrence in Castle Valley indirectly. Mountain bikes are impacting the upper Lola Montez occurrence. The Round Valley occurrence is located along ephemeral/intermittent drainages that are near the Peter Grub Hut.

***Calochortus clavatus* var. *avius* (Pleasant Valley mariposa lily):** This plant is known to grow on the Eldorado NF (ENF) and adjoining private lands in the area between Union Valley Reservoir and the North Fork of the Mokelumne River. This plant grows on a variety of soils that include serpentine, volcanic, metamorphic, and sedimentary. These plants have been found in semi-open pine over bear-clover, and in areas with black oak, ponderosa pine, and canyon slopes, spurs, and ridges with southerly aspects. The guild for this plant is general openings. The trend for this plant is that it appears to be stable on the ENF. Individual numbers can fluctuate year-to-year due to climatic triggers and disturbances such as fire. Threats from management activities include timber harvest, off-road vehicle use, livestock grazing and trampling, road construction and maintenance, reforestation (use of herbicides), firefighting/suppression, hydro/gas/transmission lines, soil movement (landslides) and development.

***Clarkia biloba* ssp. *Brandegeae* (Brandegge's fairyfan):** This plant is known to occur in Butte, Nevada, and Eldorado Counties, in Chaparral and Cismontane Woodlands (Skinner and Pavlik 1994). This plant is assigned to the gap phase, and general opening guilds. Most known occurrences are located on road cutbanks. Most occurrences are on private land in areas subject to intense development pressures. General trends are unknown. Threats include road construction and maintenance, noxious weeds, timber harvest and related activities, reforestation, livestock

grazing and trampling, firefighting/suppression, spring prescribed burning, off-road vehicle use, mining, trails/hikers/camping, and development.

***Cudonia monticola* (Large Cudonia):** This fungus is common under conifers in northern California and the Pacific Northwest. It is considered endemic to northwestern North America and is known from northern Washington, the Cascade Range, mountains of southern Oregon. In California it is known to occur on the Coast Range, in the Klamath Mountains, and northern Sierra Nevada Mountains. It has been found on the TNF in the Yuba Pass area in a campground. It is usually found in the spring or summer scattered or in dense groups, growing in humus, soil, and on rotting wood (Arora 1986). It is a Basidiomycete that is a saprophyte-decomposer. It is assumed that it is ectomycorrhizal (ECM) and that it has a broad host range including various members of the Pinaceae family. It is an epigeous ECM that is probably located within the top few centimeters of the soil. It is generally found in mature, moist coniferous forests. It has no adaptations to desiccation from loss of humidity in its micro-climate. General trends are unknown. Threats are evaluated in terms of negative impacts to the fungal mycelium and include any management activity that would significantly disturb the litter/duff/soil organics directly or indirectly. Ground-disturbing activities that reduce the amount of rotting wood and interrupt the addition of fresh wood to rot would impact this species. Other threats include activities that alter the humidity, light patterns and composition of its habitat.

***Cypripedium fasciculatum* (Clustered Lady's Slipper Orchid):** This plant is known to occur in Butte, Del Norte, Humboldt, Nevada, Plumas, Santa Clara, Santa Cruz, Shasta, Sierra, Siskiyou, San Mateo, Tehama, Trinity, and Yuba Counties, and in the states of Colorado, Idaho, Montana, Oregon, Utah, Washington, and Wyoming. There are many occurrences, but most contain only a few plants. This plant is considered threatened in the States of Idaho and Washington. It is a candidate for State listing in Oregon and is known to occur on the Mendocino, Six Rivers, Shasta-Trinity, Klamath, Lassen, Plumas, and Tahoe NFs.

This plant is most often found on north facing slopes in mixed-conifer forests with canopy closure greater than 60 percent (Kaye and Cramer 2005). It is found at elevations that range from 600 to 5,800 feet. It is placed in the interior forest and gap phase guilds. Formal studies of the response of *Cypripedium* species to disturbance are limited. However, it has been noted that when the vegetative stems of this plant are damaged, the plant showed reduced vigor the following year (Phelps 1996). A mycorrhizal symbiont(s) that is only found in mid-to-late successional forest communities may be necessary for *Cypripedium* species viability. This species may be limited by the distribution of its fungal partners (Shefferson et al. 2005). More than ½ of the populations of this species have fewer than 10 plants, which places the species at high risk. Population declines and losses of this species have been significant over the last two decades and population extinction has occurred at a high rate (44 to 55 percent) for small populations (Kaye and Cramer 2005). Trend appears to be down based on what is known about the complicated life history, which includes mycorrhizal relationships, limited establishment factors, apparent intolerance to intense disturbance, and location (lands available to timber harvest).

This orchid is sensitive to disturbances that damage their current year's growth, rhizomes, soil surrounding their root systems, and forest canopy (too much light appears to negatively affect them). A conservation assessment was completed in FY 2005 to determine the conservation status of clustered lady's slipper (*Cypripedium fasciculatum*) and Mountain lady's slipper (*C. montanum*) in Region 5, California. Threats from management activities were identified as

noxious weeds, timber harvest and related activities, reforestation, livestock grazing and trampling, catastrophic fire, fire suppression activities, fuels reduction activities including prescribed burning, off-road vehicle use, trails/hikers/camping, illegal plant collection, mining, land development, and any activities that increase erosion.

***Cypripedium montanum* (Mountain lady-slipper orchid):** The range of distribution for mountain lady slipper orchid includes many counties throughout California from Del Norte to Sierra County. It also occurs in 6 other western states. Its greatest abundance is in California is on the Klamath NF, but it is widely distributed throughout the National Forests of the Sierra Nevada except for the TNF (Kaye and Cramer 2005). The habitat for this plant is broad ranging from moist-conifer forests (Douglas-fir, white fir, mixed conifer) in partial shade (canopy closure is generally between 60 and 80 percent) to dry wooded slopes. It is most often found on north facing slopes in mixed conifer forests with canopy closure greater than 60 percent (Kaye and Cramer 2005). It is also known to occur in oak woodlands and riparian areas (along streams under or near dogwood). It is placed in the interior forest, riparian forest, and gap phase guilds. *Cypripedium montanum* grows at elevations ranging from 1,300-6,350 feet, with the majority of sites occurring between 2,500-4,000 feet. Aspect is primarily northerly, on slopes of 25 to 50 percent. More than ½ of the populations of this species have fewer than 10 plants, which places the species at high risk.

Population declines and losses of this species have been significant over the last two decades and population extinction has occurred at a high rate (44 to 55 percent) for small populations (Kaye and Cramer 2005). Trend appears to be down based on what is known about the complicated life history, which includes mycorrhizal relationships, limited establishment factors, apparent intolerance to intense disturbance, and location (lands available to timber harvest). This orchid is sensitive to disturbances that damage their current year's growth, rhizomes, soil surrounding their root systems, and forest canopy (too much light appears to negatively affect them). A conservation assessment was completed in 2005 to determine the conservation status of clustered lady's slipper (*Cypripedium fasciculatum*) and Mountain lady's slipper (*C. montanum*) in Region 5, California.

***Dendrocollybia racemosa* (Branched Collybia):** This is the only mushroom in this area (TNF) that has branches on the side of the stem. It is a small gray mushroom that is widespread in the Northern Hemisphere but is always locally rare. It grows on rotting or mummified remains of other mushrooms and sometimes in the leaf litter. It is a fall fruiting mushroom. On the TNF it is known to occur on the YRRD in the Skillman Campground and Bullard's bar areas.

***Epilobium howellii* (subalpine fireweed):** *Epilobium howellii*, when first described, was known from a total of 4 occurrences, ranging from Yuba Pass in Sierra County in the north, south to Fresno County in the Huntington Lake area, and east to Mono County. Recent survey efforts have increased the occurrence numbers to more than 100, based on a ¼ mile separation criterion (USDA 2009). Now, the known range extends from Yuba Pass on the Tahoe National Forest (NF), south through Sierra, Nevada, El Dorado, Alpine, Tuolumne, Mono, Madera and Fresno Counties (USDA 2009). The majority of occurrences are located on the Sierra NF. Population size in terms of individual plants, based on available records, range from very small, with as few as 3-5 individuals, up to 1,000,000 (USDA 2009). Due to the discovery of over 100 new occurrences over the past 5 years, CNPS has recently changed the status for this species from List 1B.3 to List 4.3 (CNPS 2009).



The subalpine fireweed grows in margins of moist meadows and mossy seeps in subalpine coniferous forest, i.e. the meadow and seep guild. Threats due to management activities include road maintenance, recreational trampling, off-highway vehicle use, livestock grazing and trampling, and any other activity that would alter the flow and/or amount of water in wet meadows and mossy seeps.

***Erigeron miser* (Starved daisy):** This plant is known to occur in Nevada and Placer Counties. It is a localized endemic of the TNF that grows in the clefts between granite outcrops at high elevations. It is placed in the general outcrop guild. Trend is unknown. The habitats for this plant are limited and fragile, i.e. short growing season and not much resilience to disturbance. Threats to this plant include rock climbers, weeds, roads, off-road vehicles, plant collectors, rock collectors, and hydro/gas/transmission lines. Surveys thus far have identified occurrences of this plant that are being impacted by motorized vehicle use of proposed roads/trails TKN-J4 and TKN-J5. In addition, YRS-F1 is also impacting an occurrence of *Erigeron miser*.

***Eriogonum umbellatum* var. *torreyanum* (Donner Pass buckwheat):** This plant is a perennial sub shrub forming large prostrate mats with glabrous leaves. The current known distribution of this buckwheat is a thin 34-kilometer long, 2-6 kilometer wide band along the eastern side of the Sierra Crest from Webber Mountain in the north to Silver Peak, just north of Squaw Valley in the south. Most plants occur in Placer and Nevada Counties, and 2 occurrences occur in Sierra County. The species is known from highly erosive volcanic soils (meiss) with sparse vegetation at 6,000 – 8,200 feet elevation in open subalpine habitats on shallow soil typically on steep east-facing slopes (Kan 1990). It occurs on the TNF where approximately 7,000 individual plants are scattered through sixteen occurrences. It has not been assigned to a guild. Initial evaluation of trend indicates a lack of stability, i.e. decline. Threats include mining, ski area development, livestock grazing and trampling (sheep), timber harvest and related activities, and other development.

***Fissidens aphelotaxifolius* (Brook pocket-moss):** *Fissidens aphelotaxifolius* is known from the Pacific states of North America from California north to British Columbia. In California, it is known from Madera (Shevock collection 2000) and Siskiyou Counties (Klamath NF and Sierra National Forests). This moss grows on wet soil, humus and rocks along narrow streams in the vicinity of small waterfalls, and in damp or wet crevices of cliffs. It is not expected in areas where peak flows wash mosses away. The species grows at elevations up to 6,300 feet. Trend is unknown. Threats include: fuel reduction, timber harvest, and livestock grazing when these activities impact riparian areas.

***Fritillaria eastwoodiae* (Butte fritillary):** The known range of this plant has historically been Shasta, Butte, Tehama, and Yuba Counties in five distinct stable population centers. It is found on unprotected private land and NFS lands mostly on the PNF. The majority of occurrences are known from locations that have not been disturbed. A small number of plants are known from areas that are believed to have experienced a light disturbance. Forty-four occurrences are known from the PNF but some have not been relocated after more than ten years after the occurrence was first discovered. Nine small occurrences of *F. eastwoodiae* have been discovered on the TNF. One unconfirmed occurrence is reported from the LNF. This plant is known to grow in chaparral, mixed conifer, and ponderosa pine in open stands of timber. It grows on a variety of soils. Many of the flowers of the known *F. eastwoodiae* plants have only anthers present, thus

seed production is not occurring in these plants. It is assigned to the gap phase guild. The trend for this plant is unknown. Threats include timber harvest, livestock grazing, off-road vehicle use, fire suppression, prescribed fire, and road construction.

***Helodium blandowii* (Blandow's bog-moss):** *Helodium blandowii* is known from Europe, Asia and across northern United States from New Jersey and Ohio west to California and Nevada, and northwards to Canada (Flowers 1973). In California, it is known from Kings Canyon National Park in Fresno County and from the Inyo and Klamath NFs. It is also known from the Mount Rose area on the Nevada side of Lake Tahoe (Shevock collection), i.e. at Tahoe Meadows, along Ophir Creek on the Toiyabe side of the LTBMU. It grows in wet meadows and seeps in subalpine coniferous forest and alpine lakes (Flowers 1973). Trend is unknown. The two most critical factors affecting the abundance and distribution of species such as *Helodium blandowii* are hydrology and the nutrient concentration of incoming water. Changes in hydrology can occur through road or trail construction/maintenance/use.

***Hydrothyria venosa* (lichen):** *Hydrothyria venosa* (now called *Peltigera hydrothyria*) is known from the mountains of western North America and the Appalachians in eastern North America. It grows on rock (occasionally on wood); in small, clear, cold streams and springs where it is submerged throughout most of the year (McCune et al. 2006). Its elevational range is about 1,150 to 7,000 feet. There are at least 89 known sites on federal lands in Washington to California. There are four known sites on the PNF. Although it has a broad distribution, its distribution is limited to isolated site clusters. It is considered rare throughout its Western range (McCune et al. 2006). Trend is unknown. Perennial water sources with little seasonal variation in water levels provide habitat. Threats include any activity that would kill or damage the habitat component of clear water.

#### ***Ivesia* species are considered together**

***Ivesia aperta* var. *aperta* (Sierra Valley Ivesia):** *I. aperta* var. *aperta* is known from Plumas, Sierra, and Washoe and Storey Counties in California and Nevada. The majority of occurrences in California are located in the Sierra Valley area. Most of the known occurrences are located on private land. This plant is found at meadow edges, in ephemeral stream channels, in meadow flats, and on gentle, rocky up-slopes near springs. It occurs in sagebrush plant communities at the floor of the eastern Sierra Nevada's. The hydrology of these habitats is easily changed, and they are prone to rapid erosion. This plant is assigned to the meadow/seep, vernal wet, and riparian woodland guilds. This plant appears to be in decline across its range. Reproduction does not appear to be occurring at levels that would maintain viability. Occurrences on private lands are threatened by habitat conversion, etc. The Tahoe, Plumas, and Humboldt-Toiyabe NFs have a conservation strategy in place for management of this plant. The most commonly recommended management prescription calls for protection from direct and indirect impacts.

***Ivesia aperta* var. *canina* (Dog Valley Ivesia):** *I. aperta* var. *canina* is known only from the Dog Valley area, Humboldt-Toiyabe National Forest, in Sierra County. This location is about 2 miles from the eastern boundary of the TNF. The habitat for this plant appears to be similar to Sierra Valley Ivesia. The Humboldt-Toiyabe NF is currently in the process of developing a conservation agreement with the USFWS. This conservation agreement will outline management plans for keeping this plant from being listed as threatened or endangered. Some of the Sierra Valley Ivesia occurrences that are located on the PNF and the TNF may be Dog Valley Ivesia. This plant is assigned to the vernal wet guild. The trend appears to be down based on the need for a conservation agreement.

***Ivesia sericoleuca* (Plumas Ivesia):** This plant is found in the vernal wet parts of meadows and alkali flats, and in vernal pools. These habitats are not widespread and are sensitive to changes in hydrology and to erosion. It is known to occur on NFS and private lands in Plumas, Placer, Sierra, and Nevada Counties. It is assigned to the meadow/seep and vernal wet guilds. This plant has a downward trend across its range due to lack of reproduction, and levels of disturbance that are occurring at known sites. The Tahoe, Plumas, and Humboldt-Toiyabe NFs have a conservation strategy in place for management of this plant. The most commonly recommended management prescription calls for protection from direct and indirect impacts.

***Ivesia webberi* (Webber's Ivesia):** *Ivesia webberi* was listed as a candidate for federal listing by USFWS February 21, 1990. It is assigned a listing priority number of 5. *Ivesia webberi* is a low, spreading, perennial herb and is restricted to shallow, clay type soils derived from andesitic rock on mid-elevation flats, benches or terraces above moderately large valleys (Witham 2000). It has been found on open summits and ridge-tops, and in meadow areas on drier, raised hummocks. Its habitat is comprised of sparse to moderately dense vegetation usually dominated or co-dominated by *Ivesia webberi* and low sagebrush or squirrel-tail grass in association with a wide variety of dwarfed, or cushion-like perennial herbs. It is known from 15 occurrences clustered in seven general locations in Lassen, Plumas, and Sierra Counties, California, and in Douglas and Washoe Counties, Nevada.

Portions of potential habitat for this species (on the TNF and PNF) were surveyed as part of a cost-share agreement with The Nature Conservancy and the TNF and PNF (Survey of Historic Locations for *Ivesia webberi* on the PNF and TNF by Duron 1990). Only one occurrence of this plant was discovered outside of the TNF boundary. This occurrence is located in Sierra Valley on private property. The rest of the known occurrences for this species are located on the Humboldt-Toiyabe NF and PNF. The Humboldt-Toiyabe finalized the Conservation Assessment and Strategy for *Ivesia webberi* (Bergstrom, 2010). This plant is assigned to the meadow and seep guild. The trend for this plant is currently unknown. However, the habitat is similar to that of Sierra Valley and Plumas Ivesia. In California, three of the seven extant populations are primarily on lands managed by the Humboldt-Toiyabe National Forest. Two of these occurrences are considered in good condition or better. The third is considered to be in poor condition (CNDDDB 2008). Although these sites are remote, they remain vulnerable to management issues such as grazing, ORV activities, dam inundation and invasion of exotic species. Four sites occur on other public (federal and state) and private lands. Condition of these sites is largely unknown, but all are subject to combinations of grazing, ORV use, development, agriculture and/or logging.

Threats to these *Ivesia* species include: livestock grazing and trampling, road construction and maintenance, off-road vehicle activities and other dispersed recreation, mining, fire suppression activities (fire camps), prescribed fire, timber harvest support activities, reservoir proposals, fuelwood gathering, target shooting, military practice camps, land exchanged, wildlife introduction (turkeys), displacement by noxious weeds (especially cheatgrass), and any activity that changes the hydrology and/or increases erosion. Occurrences on private lands are threatened by habitat conversion, etc.

***Lewisia cantelovii* (wet-cliff Lewisia):** This plant is known to grow on wet metamorphic and granitic rock cliffs and outcroppings in the Feather and Yuba River drainage systems in Plumas,

Sierra, and Nevada Counties; and in Shasta County along the Sacramento River above Shasta Reservoir (Skinner and Pavlik 1994). This plant is typically associated with moss or club moss growing on rock formations within these river canyons. It is assigned to the riparian woodland and forest guilds. The trend for this plant appears to be stable. However, monitoring of known occurrences on the TNF in 1999 showed dramatic reductions in some locations due to poaching of the plants and/or herbivory by deer. If these plants continue to be impacted, the overall trend for this plant will decline. Threats to this plant from management activities include developed trails and other trails near occurrences (increases access), mining, reservoir/hydroelectric development, prescribed fire, road maintenance, rock sources, plant collecting, and dispersed camping. Many of the occurrences located on the TNF are in areas that are popular river recreation sites. The Eldorado, Plumas, Shasta Trinity, and Tahoe NFs completed a conservation strategy for this plant in 1997. The most commonly recommended management prescription calls for protection from direct and indirect impacts.

***Lewisia kelloggii* ssp. *hutchisonii* and ssp. *kelloggii* (Hutchison's and Kellogg's Lewisia):**

*Lewisia kelloggii* ssp. *hutchisonii* is known to occur in Butte, Plumas, Sierra, and Siskiyou Counties in openings above 5,200 feet. *Lewisia kelloggii* is a highly variable species with genetic variation strongly structured by geography (Wilson et al, 2004). It grows on ridgelines in open areas on excessively drained, coarse-textured, granitic and volcanic soils. *Lewisia kelloggii* populations in California appear to be reproductively isolated (Wilson et al, 2004). Trend is unknown. Threats include road maintenance, off highway vehicle use, and fuel reduction activities. *Lewisia kelloggii* ssp. *hutchisonii* was discovered in July of 2008 immediately adjacent to the NFTS motorized trail that provides access to motorized trail YRN-11.

***Lewisia longipetala* (long-petaled Lewisia):** This plant is endemic to the LTBMU, ENF, and TNF. They are known to occur in a narrow band of subalpine plant communities at the Sierra Nevada crest, west of Truckee and south to Desolation Wilderness in El Dorado, Fresno, Nevada, and Placer Counties (Halford 1992). The TNF occurrences are located at Basin Peak (northern extent) and two located above Pole Creek (southern extent). The habitat for this plant is the leeward (north to northeast) facing slopes or basins of the ridge-tops with high snow accumulations. Plants are most often found growing within gravelly snowmelt rivulets directly below snowbanks that persist late into the season. This plant is not assigned to a guild. The trend appears to be stable. Threats include ski area development; vegetation management; livestock grazing; trail development and use; and plant collection.

***Lewisia serrata* (saw-toothed Lewisia):** The habitat for this plant is steep, metasedimentary bedrock outcrops in the American River watershed. Most plants are found in the inner gorges of perennial streams, although a few occurrences are found near seeps and intermittent streams. The factors responsible for the limited distribution of this plant have not been identified. This plant is assigned to the riparian woodland and forest guilds. Trend for this plant appears to be stable. Monitoring on the TNF and ENF has shown no declines except for those sites that have experienced poaching (illegal collection of plants). Threats are very similar to those listed under wet-cliff Lewisia. The Eldorado, Plumas, Shasta Trinity, and Tahoe NFs completed a conservation strategy for this plant in 1997. The most commonly recommended management prescription is for protection from direct and indirect impacts.

***Lupinus dalesiae* (Quincy lupine):** This plant is known to occur in Butte, Plumas, Sierra, Yuba, and Nevada Counties in California. It occupies metasedimentary and metavolcanic open-canopy sites in mixed-conifer forest plant communities. It is assigned to the gap phase and general

opening guilds. The trend for this plant is stable. Threats include road construction and maintenance; timber harvest, release, and site preparation activities; mining, and off-road vehicle use. Development is a threat on private lands.

***Meesia* moss species are considered together**

***Meesia triquetra* (Three-ranked hump-moss):** This moss is limited in distribution and numbers in California. Occurrences are known from Sierra, Sequoia, and Tahoe NFs and Sequoia National Park. This moss seems to prefer acidic meadows with *Sphagnum* (moss), *Drosera* (sundew), and *Vaccinium* (huckleberry) associates. Cold spring fed springs in the meadow also seem essential. It requires permanent saturation and is not found in meadows that dry out. It is assigned to fen and meadow and seep guilds. The elevation range is about 4,250 to 9,690 feet. The overall trend for this moss is that it is in decline. It may be extremely sensitive to alterations in meadow hydrology.

***Meesia uliginosa* (Broad-nerved hump-moss):** The range for this moss is disjunct, but it is known to occur from Siskiyou County south to Tulare County. Populations of *Meesia uliginosa* are reported to be small and infrequently encountered. On the TNF this moss grows in permanently wet, primarily spring fed plant communities called fens. This moss is assigned to fen and meadow and seep guilds. The elevation range is about 4,250 to 6,850 feet. The trend is in decline since several historic sites have not been relocated and/or the habitat has been degraded.

Threats to these *Meesia* moss species from management activities are any that change the hydrology of habitats; i.e. timber harvest, road construction, construction of fuel breaks, recreation activities, livestock grazing, etc.

***Mielichhoferia elongata* (Elongate copper moss):** This moss is known from three disjunct areas in the State of California. It is known from Mariposa, Placer, Fresno, Tulare, Siskiyou, Humboldt, Trinity, and Santa Cruz Counties. This moss grows on metamorphic, sedimentary, limestone, granite, and serpentine rock outcrops that often contain copper or other heavy metals and that are seasonally moist or less commonly on moist soil. Occurrences are generally small and isolated. Habitat is usually in foothill woodland areas dominated by oaks or chaparral and sometimes with scattered incense cedar, Douglas-fir, and ponderosa pine. It grows at elevations from about 1,600 to 4,300 feet. Trend is unknown. Threats include: road re-alignment, highway expansion, and mining.

***Monardella follettii* (Follett's Monardella):** The known distribution of this plant is from the Northern Sierra Nevada in Plumas and Nevada Counties (Skinner and Pavlik 1994). There are 6 known occurrences at this time, 4 located on NFS lands on the PNF, one occurrence located on private lands west of the TNF, and one on the LNF. This plant is known to grow on serpentine soils that are open and partially under a canopy in mixed-conifer forest. It is assigned to the Ultra-mafic outcrop guild. The trend is unknown. Threats include timber harvest and associated activities such as landing placement; road construction and maintenance; and fire suppression. Development is the major threat on private properties.

***Penstemon personatus* (Closed-throated beardtongue):** This plant is known to occur in Butte, Nevada, Plumas, and Sierra counties. There are three known occurrences on or near TNF lands. Two occurrences are known from the LNF. On the PNF, this species is known from two large population centers east and south of Bucks Lake with thousands of plants and five smaller occurrences, the smallest with less than 10 plants on the western half of the PNF. This plant is known to grow in westside mixed conifer and/or red fir plant communities. It is assigned to the

gap phase and general opening guilds. The trend appears to be stable. This plant appears to tolerate limited disturbance that does not change the microhabitat. Threats from management activities include road construction and maintenance, timber harvest activities, timber site preparation and release, high intensity burn piles, livestock grazing, mining, and off-road vehicle use.

***Phacelia stebbinsii* (Stebbins *Phacelia*):** This plant is limited in distribution, i.e. the Rubicon and American River drainages. It is currently known to exist only within the greater boundaries of the TNF and ENF, with occurrences located on private and NFS lands. It is known to grow on a wide variety of soils. It is assigned to the gap phase and general outcrop guilds. On the ENF, the trend appears to be stable. On the TNF, the trend is unknown. Threats on the ENF are unlikely except for possible hydroelectric development due to remoteness of habitat. Threats on the TNF include mining; road and trail construction; and recreation activities such as fishing, off-road vehicle use, dispersed camping, hiking, and river access for swimming.

***Phaeocollybia olivacea* (Olive *Phaeocollybia*):** This Basidiomycete is a mycorrhizal fungus that functions in nutrient cycling. It is a fall-fruiting mushroom that is known to grow in conifer and oak forests. It is endemic to the western United States from the central Oregon coast south to Santa Cruz County. On the TNF it is known to occur on the Yuba River Ranger District in the Hornswoggle Campground area near Bullard's Bar Reservoir and along the Schoolhouse Trail near Schoolhouse Campground. Absence of the fungus cannot be determined during surveys since there is no way to determine whether the underground portion of the fungus (i.e. the mycelia) is present or not.

***Pyrrocoma lucida* (Sticky *Pyrrocoma*):** This plant is found in meadows and alkali flats in Plumas, Sierra, and Yuba Counties. Occurrences are found on PNF and TNF and private lands. It is assigned to the meadow and seep, vernal wet, and riparian woodland guilds. The trend for this plant is that it appears to be in decline due to lack of reproduction. Sticky *Pyrrocoma* grows in habitats similar to *Ivesia sericoleuca*. These habitats have been reduced in number by a variety of activities. Most of the known occurrences are either unprotected on private land, are repeatedly grazed on NFS lands, and/or impacted by road management agencies during maintenance activities within road right-of-ways. Threats from management activities include livestock grazing, reservoir development, meadow restoration, off-road vehicle use, recreation activities, fire suppression camps, military camps, prescribed burning and other fuel treatments, timber harvest associated activities such as landings, fuelwood gathering, and land exchange.

***Tauschia howellii* (Howell's *Tauschia*):** This plant is found in subalpine coniferous forest and upper montane coniferous forest. It is known in California from only five occurrences. It is known to occur on the TNF in the Keystone Gap area. Trend is unknown, but it is a candidate for state listing in Oregon. Threats include recreational activities on steep, erosive slopes.

## **Appendix Y: Botanical References**

Abrams, L. 1940. Illustrated Flora of the Pacific States Vol. I-IV. Stanford University Press.

Arora, D., 1986. Mushrooms Demystified. Ten Speed Press, P.O. Box 7123, Berkeley, C 94707.

[Augé, R. M.](http://notes.utk.edu/bio/unistudy.nsf) Mycorrhizal symbiosis and plant responses to the environment.  
<http://notes.utk.edu/bio/unistudy.nsf>

Barneby, R.C. 1964. Atlas of North American *Astragalus*. Memoirs of the New York Botanical Garden. 13:1-1188.

Bergstrom, E. 2010. Conservation Assessment and Strategy for *Ivesia webberi*. Humboldt Toiyabe National Forest, 1200 Franklin Way, Sparks, Nevada 89431-6432

Brodo, I.M., S. D. Sharnoff and S. Sharnoff, 2001. Lichens of North America. Yale University Press, New Haven and London.

California Native Plant Society. 2001. Inventory of Rare and Endangered Plants of California (6th edition). Rare Plant Scientific Advisory Committee, David P. Tibor, Convening Editor. California Native Plant Society. Sacramento, CA. 388pp.

Christy, J.A. and D.H. Wagner. 1996. Guide for the identification of rare, threatened or sensitive bryophytes in the range of the spotted owl, Western Washington, Western Oregon and Northwestern California. USDI Bureau of Land Management, USDA Forest Service, The Nature Conservancy and Northwest Botanical Institute. BLM-Oregon-Washington State Office, Portland.

Dillingham, C. 2004 and 2005. HFQLG Monitoring Reports. Unpublished.

Dillingham, C. 2005. Conservation Assessment for *Meesia triquetra* (L.) Aongstr. (three-ranked hump-moss) and *Meesia uliginosa* Hedwig (broad-nerved hump-moss) in California with a focus on the Sierra Nevada Bioregion Version 1.1; (Available at the Truckee Ranger District.)

Duron, Wendy. 1990. Survey of Historic Locations of *Ivesia webberi* on the Plumas and Tahoe National Forests. Nature Conservancy; USDA Forest Service, Plumas and Tahoe National Forests. Unpublished report.

Eisler, R. 1990. Boron hazards to fish, wildlife, and invertebrates: a synoptic review. U.S. Fish Wildlife Service Biology Report (85).

Farrar, Donald R. 2002. Systematics of western moonworts: *Botrychium* subgenus *Botrychium*. Unpublished report.

Ferguson, Linda 2012. Fire/Fuels Specialist Report for the Sagehen Project. (Part of the Sagehen Project EA).

Gignac, L. D. and D.H. Vitt. 1990. Habitat limitations of Sphagnum along climatic, chemical and physical gradients in mires of western Canada. Bryologist. 93: 7-22.

Halford, Anne. 1992. Interim Management Guide for *Lewisia longipetala* (Tahoe and Eldorado National Forests and Lake Tahoe Basin Management Unit). Cost-share agreement with the California Native Plant Society and the Forest Service. USDA Forest Service, Pacific Southwest Region. Administrative Report.

Harrod, R.J., D.E. Knecht, E.E. Huhlammm, M.W. Ellis, and R. Davenport. Effects of the Rat and Hatchery Creek fires on four rare plant species. In: Proceedings – Fire Effects on rare and Endangered Species and Habitats Conference, Nov. 13-16, 1995. Cour D’Alene, Idaho.

Hawk, W.D. and C.H. Haufler. Isozyme variability among cryptic species of *Botrychium* subgenus *Botrychium* (Ophioglossaceae). American Journal of Botany. 1999: 86-614.

- Hickman, J. 1993. The Jepson Manual Higher Plants of California. University of California Press, Berkeley, CA. 1400p.
- Hitchcock, C.L. and B. Maguire. 1947. A Revision of the North American Species of *Silene*, U. of Wash. Publications in Biology, Vol. 13.
- Hoch, P.C. 1992. A new species of *Epilobium* (Onagraceae) in California. *Phytologia* (December 1992) 73(6): 460-462.
- Ikeda, D.H. and J.A. Witzman, 1989. Ecological survey and status report for *Astragalus webberi* on the Plumas National Forest. A cost-share agreement between the Nature Conservancy and the Plumas National Forest. Administrative report.
- Johnson-Groh, C. L.. 1995. The Effects of Fire on Prairie Moonworts, *Botrychium gallicomonatum* and *B. campestre*. Poster presentation at the 1995 International Association of Wildlands Fire Conference.
- Johnson-Groh, C. L., and D. R. Farrar. 1996. The effects of fire on prairie moonworts (*Botrychium* subgenus *Botrychium*). *American Journal of Botany* 83:134 (abstract).
- Johnson-Groh, C. L. 2009. Personal Communication email.
- Kan, T. 1993. Interim Management Guide for *Eriogonum umbellatum* var. *torreyanum*. A cost-share agreement between The Nature Conservancy and Tahoe National Forest, USDA Forest Service, Pacific Southwest Region. Administrative report.
- Karron, J.D. 1987. The pollination ecology of co-occurring geographically restricted and widespread species of *Astragalus* (Fabaceae). *Biological Conservation* 39: 179-193.
- Kuhn, T.J., H. D. Stafford, B.E. Jones and K. W. Tate. 2011. Aspen (*Populus tremuloides*) stands and their contribution to plant diversity in a semiarid coniferous landscape. *Plant Ecology*: Accepted March 28, 2011: Springer: Science + Business Media (outside the US).
- Laeger, Eve. 2002. *Botrychium* surveys in California, Unpublished report prepared for the USDA Forest Service, Pacific Southwest Region, Bodfish, CA.
- Lawlor, Shawna, et. al. 1988. Interim Management Guide for *Silene invisa*, (pg. 18). Eldorado, Plumas, and Tahoe National Forests.
- McCune, B. and L. Geiser. 1997. *Macrolichens of the Pacific Northwest*. Oregon State University Press, April 1997.
- Nelson, K. 2007. Draft Conservation Assessment for *Epilobium howellii* P. Hoch. USDA Forest Service, Pacific Southwest Region, Inyo, Sierra, Eldorado, Tahoe, Plumas National Forests and Lake Tahoe Basin Management Unit. Unpublished.
- Norris, D.H. and Shevock, J. R. 2004. Contributions toward a Bryoflora of California: 1. A specimen based Catalogue of Mosses. *Madrono*, Volume 51, Number 1.
- Phelps, K. 1996. "Species Account for *Cypripedium fasciculatum*." USDA Forest Service, White River National Forest, Dillon Ranger District.
- Richerson, S. 1997. Interim management guide for *Lewisia cantelovii* and *Lewisia serrata* (Eldorado, Plumas, Shasta Trinity, and Tahoe National Forests). Administrative Report. USDA Forest Service, Pacific Southwest Region.



- Rushing, A.E. 1986. A revision of the genus *Bruchia* Schwaegr. (Musci): Journal of the Hattori Botanical Laboratory. 60:35-83.
- Sawyer, J.O. and T. Keeler-Wolf. 1995. A Manual of California Vegetation. California Native Plant Society. 471p.
- Schierenbeck, K. 1995. The treat to the California flora from invasive species; problems and possible solutions. Madrono (42) 2, pp. 168-174.
- Seevers, J. and F. Lang. 1998. Management recommendations for Clustered Lady's Slipper (*Cypripedium fasciculatum* Douglas ex Lindley). Version 2.0, December 1998. In: USDA Forest Service Region 5/6 and USDI Bureau of Land Management OR/WA/CA, 1998, Management Recommendations for Vascular Plants. Portland, Oregon.
- Siegel, Donald I. 1988. Evaluating Cumulative Effects of Disturbance on Hydrologic Function of Bogs, Fens and Mires. Environmental Management 12(5): pp. 621-626.
- Skinner, M. W. and B. M. Pavlik, eds. 1994. Inventory of Rare and Endangered Vascular Plants of California. 5th edition, California Native Plant Society Special Publication Number 1.
- Stohlgren, Thomas J., D. Bindley, G. Chong, M. Kalhan, K. Snell, K. Bull, Y. Otusuki, G. Newman, M. Bashkin, and Y. Son. 1999. Exotic plant species invade hot spots of native plant diversity. Ecological Monographs, 69(1). Pp. 25-46.
- Swartz, L.M. and S. J. Brunsfeld. The morphological and genetic distinctness of *Botrychium minganense* and *Botrychium crenulatum* as assessed by morphometric analysis and RAPD markers. American Fern Journal 92 (4):249-269 (2002).
- Thorne, R.F. 1976. The vascular plant communities of California. In: Plant communities of southern California. J. Latting. California Native Plant Society, Special Publication No. 2, xii + 164 p.
- Urie, S.C., 2003. Conservation Assessment of *Pyrrocoma lucida* (Keck) Kartesz & Gandhi. USDA Forest Service, Tahoe and Plumas National Forests.
- USDA Forest Service. 2002. Tahoe National Forest Sensitive Plant Program Standards and Guidelines. Administrative Report, Pacific Southwest Region, Tahoe National Forest.
- USDA Forest Service. 2003. Tahoe National Forest Noxious Weed Program. Administrative Report, Pacific Southwest Region, Tahoe National Forest.
- USDA Forest Service. 1988. A Guide to Wildlife Habitats to California. Pacific Southwest Forest and Range Experiment Station.
- USDA Forest Service. 2001. Sierra Nevada Forest Plan Amendment, Final Environmental Impact Statement, Volume 3 of 6 (Chapter 3, part 4). Pacific Southwest Region, Vallejo, CA.
- USDA. 1996. Notes on *Cypripedium fasciculatum* and *C. montanum*. Unpublished document. Includes notes from Knecht, Urban, Goldenberg, Knight, and Pappalardo. 1996.
- USDA Forest Service. 2005d. Sanger, A., Ed. *Botrychium montanum* draft Region 5 Sensitive Plant Species Evaluation and Documentation Form Unpublished report. Pacific Southwest Region, USDA Forest Service.

- USDI Fish and Wildlife Service. 2001. Endangered and threatened wildlife and plants; 12-month finding for a petition to list the plant *Botrychium lunaria* (slender moonwort) as threatened. Federal Register. 30368, Vol. 66, No. 109.
- USDI Fish and Wildlife Service. 2002. Endangered and Threatened Wildlife and Plants; Review of Species That Are Candidates or Proposed for Listing as Endangered or Threatened; Annual Notice of Findings on Recycled Petitions; Annual Description of Progress on Listing Actions. Federal Register. (Vol. 67, Number 114)
- USDI Fish and Wildlife Service 2003. Endangered and threatened Wildlife and Plants; Delisting of the *Berberis* (=Mahonia) *sonnei* (Truckee Barberry). Federal Register; October 1, 2003 Volume 68, Number 190).
- Wagner, W.H. and T.B. Devine. 1989. Moonworts (*Botrychium*: Ophioglossaceae) in the Jonesville area, Butte and Tehama Counties, California. Madrono: Vol. 36:131-136.
- Wagner W.H. and F.S. Wagner. 1994. Another widely disjunct, rare and local North American moonwort (Ophioglossaceae: *Botrychium* subgenus *Botrychium*). American Fern Journal 84(1):5-10.
- Wagner, W.H. and F.S. Wagner. 1989. Three new species of moonworts (*Botrychium* subgenus *Botrychium*) endemic in western North America. American Fern Journal 76(2):33-47 (1986).
- Weixelman, D. and Atwood, D. Sensitive Plant Field Guide, Toiyabe National Forest.
- Weixelman, D. A. and D. J. Cooper, 2009. Assessing Proper Functioning Condition for Fen Areas in the Sierra Nevada and Southern Cascade Ranges in California, A User Guide. Gen. Tech. Report. R5-TP-028. Vallejo, CA. Department of Agriculture , Forest Service, Pacific Southwest Region. 42p.
- Winter, T.C. 1988. A conceptual framework for assessing cumulative impacts on the hydrology of non-tidal wetlands. Environmental Management 12(5):605-620.
- Witham, Carol W. 2000. Current knowledge and conservation status of *Ivesia webberi* Gray (Rosaceae), the Webber Ivesia, in Nevada. Status report prepared for Nevada Natural Resources and U.S. Fish and Wildlife Service, Nevada State Office.